A First Course on Kinetics and Reaction Engineering

Unit 11 Additional Quiz Questions

1. True or false? When collecting kinetic data using a CSTR, it is preferable to operate the reactor at steady state.
2. True or false? The PFR reactor model assumes that the fluid is perfectly mixed in the axial direction and completely unmixed in the radial direction
3. Which of the following is required for a reactor operating at steady state?
   a. the temperature is the same everywhere in the reactor
   b. the composition is the same everywhere in the reactor
   c. there must be coolant flowing in the reactor jacket or cooling coil
   d. at any point in the system, the temperature and composition do not vary over time
   e. at any time in the system, the temperature and composition do not vary with position
4. Which of the following is true of plug flow?
   a. the velocity profile (linear velocity as a function of radial position) is parabolic
   b. the velocity profile is cubic
   c. the velocity profile is random
   d. the velocity profile is flat
   e. there is no velocity profile
5. True or false? All perfectly mixed reactors consist of a tank with a stirrer.
6. True or false? Berty and Carberry reactors are special kinds of CSTRs that are suitable for use with heterogeneous catalysts.
7. True or false? The flow within the recirculation loop of a recirculation loop reactor is very slow.
8. True or false? A PFR can be made from a length of glass tubing or pipe.
9. True or false? A stopped flow reactor is a kind of CSTR.
10. True or false? Because both are ideal, the CSTR and the PFR have identical age functions.
11. True or false? The age function for a CSTR is simply a step change from 0 to 1 occurring at λ equal to the average residence time.
12. True or false? The age function for a PFR is simply a step change from 1 to 0 occurring at λ equal to the average residence time.
13. True or false? The age function for a CSTR is an exponential function starting at 0 that rises and then levels off at a value of 1 as λ approaches infinity.
14. True or false? The average residence time is equal to the volume of fluid within the reactor divided by the volumetric flow rate into the reactor.
15. True or false? If the experimentally measured age function for a laboratory reactor exactly matches the age function for an ideal CSTR, then it is always safe to model the laboratory reactor as an ideal CSTR.
16. Which of the following does NOT test the ideality of flow in a reactor?
   a. comparing the experimentally measured age function to that for an ideal reactor
   b. a smoke test
   c. simultaneously measuring the composition and temperature at several locations within a reactor after a stimulus has been applied
   d. a screen test

17. True or false? If the characteristic time for reaction to occur is shorter than the characteristic time for mixing, the reactor cannot be modeled as perfectly mixed even if it displays an age function equal to that of an ideal perfectly mixed reactor.
18. True or false? A smoke test allows you to visually observe the rate and completeness of mixing.