1. The Goal of Piping Engineering can be defined as:
   - b. Assuring the installed pipe meets Code requirements.
   - c. Assuring Owner preferences are included whenever requested.
   - d. Assuring the pipe can perform reliably and safely in all expected conditions for its design life.

2. Which of the following statements are true?
   - a. Each piping system has potential failure modes.
   - b. Pipe has limitations in age and usage.
   - c. Pipe is manufactured and installed to very exacting tolerances.
   - d. Piping systems are subjected to limited and well defined loading conditions.
   - e. A & B only
   - f. A & C only

3. If you are working with a piping system in a power plant, the applicable ASME code(s) is most likely:
   - a. ASME B31.1
   - b. ASME B31.3
   - c. ASME B31.5
   - d. ASME B31.8

4. The following statement best defines the ASME piping codes:
   - a. Provides guidelines and minimum standards
   - b. Provides detailed procedures for all analysis
   - c. Provides detailed procedures for long term maintenance and inspection of piping systems
   - d. Provides all the information required to perform piping engineering.

5. Which of the following statements is false?
   - a. The design conditions for the equipment must be coordinated with the design conditions of the piping system.
   - b. Equipment nozzles may move due to thermal growth from ambient to operating condition.
   - c. Equipment nozzles are as strong as the pipe, and rarely are loads on equipment a concern
   - d. Piping supplied with the equipment should be considered as part of the piping system.

6. Pipe material temperature limits are almost always the same as a piping system engineering design condition.
   - a. True
   - b. False

7. A reasonable “Rule of thumb” for water velocity in a pipe is:
   - a. 15 feet per second
   - b. 30 feet per second
   - c. 50 feet per second
   - d. 100 feet per second

8. In selecting materials for high temperature service some of the considerations could be:
   - a. Creep
   - b. Hydrogen embrittlement
   - c. Seamless or seam welded construction
   - d. All of the above

9. Which of the following phenomena can create local failure in an otherwise satisfactory piping system?
   - a. Vortex shedding
10. Which best describes the limits of a piping system for evaluation?
   a. Pipe from contractual limit to contractual limit
   b. Pipe, pipe supports and significant branch pipes from contractual limit to contractual limit
   c. Pipe from equipment nozzle to equipment nozzle
   d. Pipe, pipe supports and significant branch pipes from equipment nozzle to contractual limit
   e. Pipe and significant branch pipes from equipment nozzle to equipment nozzle
   f. Pipe, pipe supports and significant branch pipes from equipment nozzle to equipment nozzle

11. When deciding if a branch line should be included as part of the system, the following rule usually applies
   a. The branch pipe outside diameter is less than half the header diameter
   b. The ratio of the header to branch pipe section modulus is less than 7.
   c. The branch pipe is rigidly supported within 7 pipe diameters of the header.
   d. The branch pipe flow is usually valved off.

12. The hoop stress is:
   a. About the same as the longitudinal pressure stress
   b. About two times the longitudinal pressure stress
   c. About four times the longitudinal pressure stress
   d. About ten times the longitudinal pressure stress

13. If an unrestrained pipe is 100 feet long and heated from ambient to 800F, the pipe should
   a. Lengthen about 10”
   b. Lengthen about 7”
   c. Lengthen about 3”
   d. Shorten about 8”

14. The first choice for absorbing thermal movement in a piping system should be:
   a. Add expansion joints
   b. Use cold spring
   c. Restrain the pipe rigidly to keep it from moving
   d. Let the pipe and elbows flex to absorb the movement.

15. Expansion joints require
   a. Guides on the pipe to assure there is not excessive rotation
   b. Tie rods or pipe anchors if the longitudinal pressure force exceeds the expansion joint allowable
   c. Periodic inspection and possibly replacement
   d. All of the above

16. Pipe support spacing tables from the internet
   a. Are always conservative and can be used for locating pipe supports.
   b. Are dangerous to trust because the basis of the calculations is not known
   c. Do not need to be modified for valves and elbows
   d. Do not need to be modified for branch connections

17. A calculated pipe support load of 0 lbs or less means
   a. The support may not be needed
   b. The support type may need to be modified
   c. The support spacing may need to be modified
   d. All of the above

18. Safety Valve thrust forces can
   a. Over stress a standard header nozzle connection
   b. Damage the pipe header by excessive deflection
c. Create a requirement for special header supports
d. All of the above

19. Criteria for determining if a piping system should be analyzed for a seismic event include:
   a. Seismic zone
   b. Contents of pipe
   c. Owner plans for operation through, or re-start after a seismic event
   d. All of the above

20. Steam hammer is a major dynamic event created by
   a. Flashing water to steam
   b. Flow pulsations created during normal operation
   c. Fast acting valves
   d. Safety valve thrust

21. Water hammer is a major dynamic event that
   a. Must be avoided by proper design and operation of drains
   b. Should be restrained by rigid supports
   c. Can be analyzed with hand calculations in ASME B31.1
   d. Produces loads similar in magnitude to wind loads

22. A pipe support whose support load varies with displacement is a
   a. Rigid rod hanger
   b. Variable spring hanger
   c. Hydraulic snubber
   d. Constant support hanger

23. A pipe support that restrains all three orthogonal movements and all three orthogonal rotations is a
   a. Sway strut
   b. Rigid stanchion with axial restraint and lateral guide
   c. Rigid rod hanger with guide
   d. Anchor

24. Travel stops
   a. Are installed by vendors to preset the specified ambient condition displacement
   b. Must be removed prior to operation
   c. Should be saved for later use
   d. All of the above

25. Pipe analysis calculations are very accurate compared to the installed pipe actual pipe stresses and movements.
   a. True
   b. False