Multiple Choice – Clearly circle the correct answer. There is ONLY one answer to each statement.

1. Which statement most accurately defines what a liquid is?
   1. Something that can flow.
   2. Something that changes to a solid by removing heat.
   3. Something that evaporates.
   4. All of the above
2. Which of the following is least likely to be a fluid?
   1. Water in a bucket
   2. Moist clay in a bucket
   3. Dry sand in a bucket
   4. Rocks in an Avalanche
3. We can describe the behavior of most fluids by thinking about the behavior of:
   1. Waves on the shore of the ocean
   2. Clouds moving through the sky
   3. Marbles moving inside a box
   4. A school of fish swimming in the ocean
4. To perform calculations using fluids, the temperature must be expressed in:
   1. Degrees Rankine
   2. Degrees Fahrenheit
   3. Any temperature scale
   4. Degrees relative to the freezing point of water
5. The absolute pressure is:
   1. The pressure relative to atmospheric pressure.
   2. The pressure relative to a vacuum.
   3. The measured pressure in psi.
   4. Not necessary to perform mathematical calculations using pressure.
6. Which of the following is a phase of water:
   1. Dry ice
   2. Dew
   3. hydrocarbon liquid
   4. MEA
7. Gauge pressure in a vessel is caused by:
   1. The impacting force of individual molecules colliding with the interior walls of the vessel
   2. Bricks piled upon the stationary roof of the vessel
   3. The pressure of the atmosphere pushing on the vessel
   4. The balance between the atmospheric pressure and the pressure detected by the guage.
8. If two fluids are miscible they:
   1. Do not mix and the heavier liquid will float on top of the lighter liquid
   2. Mix together and no separation will occur
   3. Do not mix and the lighter fluid will float upon the heavier one
   4. None of the above.
9. A good description of the vapor pressure is:
   1. The pressure of the vapor that is in equilibrium above its liquid phase in a closed container
   2. The pressure of the gas in a closed container
   3. The temperature at which the liquid freezes in a closed container.
   4. The pressure of a vapor in an open container of liquid.
10. At a given temperature, when the pressure above a liquid in a closed vessel equals the vapor pressure of the substance, then the substance is:
    1. solid
    2. freezing
    3. gas
    4. boiling
11. A 50:50 mixture of two hydrocarbon liquids in a closed vessel produces a gas mixture in the headspace of:
    1. 50:50
    2. 70:10
    3. Ratio determined by the vapor pressures of the two individual liquids in the vessel.
    4. There will be no vapor in the headspace unless the boiling temperature of the lightest hydrocarbon has been exceeded.

Fill in the Blanks:

1. The specific gravity of ethane gas at standard conditions is equal to \_\_\_\_\_\_\_\_\_\_\_\_\_.
2. The critical point of ethane occurs at a temperature equal to \_\_\_\_\_\_\_\_\_\_\_\_\_\_⁰F and a pressure equal to \_\_\_\_\_\_\_\_\_\_\_\_ psia.
3. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is that pressure for a liquid in a mixture above which the liquid mixture cannot be separated.
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is that amount required to be left as vapor space in a vessel to allow for free expansion of the liquid in the vessel.
5. \_\_\_\_\_\_\_\_\_\_\_\_ are an icy mixture of hydrocarbons and water that can form at temperatures as high as 80 ⁰F.
6. The abbreviation C3 tells you that the gas you are talking about is \_\_\_\_\_\_\_\_\_\_\_.
7. The common hydrocarbon gas that is lighter than air at standard conditions is \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
8. 44 lbs of propane is equal to one \_\_\_\_\_\_\_\_\_ of the gas.
9. The temperature that a substance changes from solid to liquid or liquid to solid is called its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
10. To decrease the temperature of a gas you must transfer \_\_\_\_\_\_\_\_\_\_\_\_\_ out of the gas.

Match the name of the equipment to the correct drawing by **placing the correct letter in the blank next to the drawing** from this list:

1. Chiller
2. Heat Exchanger
3. Reciprocating Pump
4. Air cooler
5. Reciprocating Compressor
6. Vertical Tank
7. Horizontal Tank
8. Centrifugal Pump
9. Centrifugal Compressor
10. Reboiler
11. Shell and tube

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The following PFD describes the primary operating elements of the In Feed System in a Gas Processing Plant.

**K**

List the name of each piece of Equipment or Process Flow marked by the letters above into each of the blanks below that correspond to the letter:

* + - 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      9. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      10. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      11. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Write the letter corresponding to the definition for the following words in the space provided.

* 1. Pressure \_\_\_\_\_\_\_\_
  2. Gravity (density) \_\_\_\_\_\_\_\_
  3. Solubility \_\_\_\_\_\_\_\_
  4. Freezing point \_\_\_\_\_\_\_\_
  5. Phase \_\_\_\_\_\_\_\_
  6. Vapor pressure \_\_\_\_\_\_\_\_
  7. Boiling point \_\_\_\_\_\_\_\_
  8. Hydrates \_\_\_\_\_\_\_\_
  9. Heat \_\_\_\_\_\_\_\_
  10. Composition \_\_\_\_\_\_\_\_

1. The temperature below which the substance changes from gas to liquid.
2. The ability of two fluids to mix together without separating.
3. The gas pressure in equilibrium with a liquid in a closed container.
4. The physical state of a substance as a solid, liquid or gas.
5. The measured quantity resulting from the additional of heat to a group of molecules.
6. The temperature above which the substance changes from solid to liquid.
7. A parameter defining the amount of one substance that will dissolve into another.
8. The form of energy that causes the temperature of a substance to increase.
9. The specific arrangement of atoms defining a particular substance.
10. A solid substance formed from free water and hydrocarbons.
11. The relative amount of a substance contained in a specific volume.
12. The impacting force of molecules in a container spread over the surface area of that same container.

Calculating Mole Percent – SHOW YOUR WORK

You have the following mixture of gases:

64 lbs of methane

30 lbs of ethane

44 lbs of propane

Calculate the number of moles of each.

Methane = \_\_\_\_\_\_\_\_\_\_\_\_\_ mole(s)

Ethane = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mole(s)

Propane = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ mole(s)

Calculate the mole percent of each.

Methane = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mole percent

Ethane = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mole percent

Propane = \_\_\_\_\_\_\_\_\_\_\_\_\_ mole percent