

**Final Exam**  
Continuing Education Course #029  
Geothermal Heating and Cooling

1. There are about \_\_\_\_ pounds of carbon in a gallon of gasoline or heating oil.
  - ☐ a. 4
  - ☐ b. 5
  - ☐ c. 6
  - ☐ d. 7
2. The ratio of energy efficiency for heating, not cooling, is:
  - ☐ a. The Energy Efficiency Ratio(EER)
  - ☐ b. Kilowatts per Hour (Kw/Hr)
  - ☐ c. The Coefficient of Performance (COP)
  - ☐ d. Entropy
3. A modern Ground Source Heat Pump can deliver either heat or air conditioning to a living space, but not both.
  - ☐ a. True
  - ☐ b. False
4. After heating and cooling, the greatest draw on electric power in a home is:
  - ☐ a. The refrigerator
  - ☐ b. Lighting
  - ☐ c. Water Heater
  - ☐ d. Electronics
5. Which of the following is not a desirable characteristic of a property considering a GSHP trench system?
  - ☐ a. Deep wet soils
  - ☐ b. Extensive landscape trees and structures
  - ☐ c. Large acreage
  - ☐ d. Nearby meadow area
6. If Call Before You Dig locates underground electric service at the proposed loop field, plan to install under it.
  - ☐ a. True
  - ☐ b. False
7. The pressure rating on standard HDPE Ground Loop Pipe is:
  - ☐ a. 20 psi
  - ☐ b. 40 psi
  - ☐ c. 100 psi
  - ☐ d. 160 psi
8. A 4" dia. footing drain can be crossed by cutting it and placing the CL Pipe below it and re-coupling it.

- ☐ a. True
- ☐ b. False

9. Wetlands Commissions endorse GSHP systems, so no permits or erosion control measures are needed in their Buffer jurisdictions:

- ☐ a. True
- ☐ b. False

10. The average ground temperature in Stillwater, OK where the IGSHPA is located is:

- ☐ a. 62 degrees
- ☐ b. 52 degrees
- ☐ c. 47 degrees
- ☐ d. 68 degrees

11. What is the average ground temperature from figures 9 and 10 in New York City on April 28th at a depth of -12 feet?

- ☐ a. 40 degrees
- ☐ b. 48 degrees
- ☐ c. 62 degrees
- ☐ d. 65 degrees

12. The Thermal Conductivity K in BTU per (hour x foot x degree Fahrenheit) for saturated silty clay is:

- ☐ a. 0.2
- ☐ b. 0.5
- ☐ c. 1.0
- ☐ d. 1.4

13. On the U.S. Dept. of Agriculture's Web Soil Survey web site, the soil region to be delineated is the:

- ☐ a. Soil Map Unit(SMU)
- ☐ b. Area of Interest (AOI)
- ☐ c. Web Soil Survey
- ☐ d. None of the above

14. OSHA requires a protective system of sloping, shoring or shielding in trenches exceeding which depth?

- ☐ a. 2'
- ☐ b. 3'
- ☐ c. 4'
- ☐ d. 5'

15. A ditch witch that can be rented at most equipment rental establishments can easily dig down 6' in most soils and rock.

- ☐ a. True
- ☐ b. False

16. In choosing Loop Pipe Length, factor in:

- ☐ a. Depth
- ☐ b. Design BTU load
- ☐ c. Soil Type
- ☐ d. All of the above

17. It is more efficient to circulate water and Propylene Glycol through a 2" dia. Loop Pipe with less skin friction, than a 1 1/4" or 3/4" Loop Pipe.

- ☐ a. True  
☐ b. False
18. 3" diameter and larger loop pipes are uncommon for small residential and commercial trenches.  
☐ a. True  
☐ b. False
19. There are no formulae available to check accuracy of Loop Pipe Lengths.  
☐ a. True  
☐ b. False
20. To make trench loop installation easier, use shorter lengths, and connect them with standard interior type fittings.  
☐ a. True  
☐ b. False
21. Slinky and parallel systems that connect to a buried manifold must be heat fused by certified personnel only.  
☐ a. True  
☐ b. False
22. A Desuperheater is used for:  
☐ a. Air duct humidity control  
☐ b. Maximizing Air Conditioner performance  
☐ c. Domestic Hot Water  
☐ d. None of the above
23. Closed GSHP systems require surveyed topographical elevations to minimize head loss.  
☐ a. True  
☐ b. False
24. A larger building with inferior insulation will require a shorter length of Loop Pipe.  
☐ a. True  
☐ b. False
25. Heating temperatures produced by a heat pump for use in an air handler are:  
☐ a. 140-150 degrees  
☐ b. 110-120 degrees  
☐ c. 60-80 degrees  
☐ d. 40-60 degrees
26. A building with three heating and cooling zones can have combinations of heating and cooling systems.  
☐ a. True  
☐ b. False
27. Among the concerns of drilling through an existing concrete wall for Loop Pipe are:  
☐ a. Dust control  
☐ b. Waterproofing the outside  
☐ c. Securing the Loop Pipe against rubbing fatigue  
☐ d. All of the above
28. A proper GSHP system installed for a homeowner at a cost of \$28,000 in the year 2021 receives a Federal Tax Credit of:

- ☐ a. \$1400
- ☐ b. \$2800
- ☐ c. \$7280
- ☐ d. \$9000

29. To become a certified GSHP system installer for large projects, one must take the \_\_\_\_ day IGSHPA course and test:

- ☐ a. half
- ☐ b. 1
- ☐ c. 2
- ☐ d. 3