1. According to *Guide to Shotcrete*, another name used for dry mix shotcrete is:

   A. batching  
   B. gunite  
   C. shotcrete  
   D. slugging

2. Shotcrete in which all of the ingredients including water are mixed before introduction into the delivery hose is referred to as:

   A. wet-mix  
   B. rebound-mix  
   C. dry-mix  
   D. feed-mix

3. According to *Guide to Shotcrete*, the water to cementations materials ratio for wet mix shotcrete without admixtures typically falls within the range of:

   A. .30 to .05  
   B. .25 to .45  
   C. .30 to .50  
   D. .40 to .50

4. The unit weight of good shotcrete is about the same as conventional concrete falling in the range of between pcf.

   A. 129 and 139  
   B. 139 and 149  
   C. 149 and 159  
   D. 159 and 169

5. According to *Guide to Shotcrete*, ________ shotcrete has been and continues to be the largest application for shotcrete.

   A. conventional  
   B. specialty  
   C. refractory  
   D. universal
6. According to *Guide to Shotcrete*, the maximum distance from the nozzle to the work should not exceed:

   A. 2 feet  
   B. 4 feet  
   C. 6 feet  
   D. 8 feet

7. According to *Guide to Shotcrete*, oversized pieces of aggregate should be rejected by screening, as they are likely to cause ______ of the hose or nozzle.

   A. induction  
   B. plugging  
   C. scaling  
   D. reduction

8. It is recommended that the mixing water for shotcrete be potable water. If potable water is not available, the water must be tested to assure that strengths of mortar cubes made with it are at least ______ percent of that of mortar cubes made with distilled water.

   A. 75  
   B. 80  
   C. 85  
   D. 90

9. According to Guide to Shotcrete, architectural shotcrete should be cured with water free from elements that will cause_________.

   A. staining  
   B. scaling  
   C. entraining  
   D. puddling

10. According to Guide to Shotcrete, air entrainment tends to enhance _______ and reduce rebound.

    A. stiffer  
    B. leaner  
    C. weaker  
    D. pump ability
11. According to *Guide to Shotcrete*, water-reducing admixtures increase _______ without increasing w/cm.

A. air entrainment  
B. strength  
C. workability  
D. pump ability

12. According to *Guide to Shotcrete*, reinforcements should be free from _______ or other surface deposits that may affect bond to shotcrete.

A. dampness  
B. mill scale  
C. tight rust  
D. scratches

13. Commonly used welded wire fabric gages are W2 or W1.4 wire, spaced _______ inches in both directions.

A. 2  
B. 4  
C. 6  
D. 8


A. 2  
B. 4  
C. 6  
D. 8

15. The type of gun used for dry-mix shotcrete that allows for continuous operation by using the upper chamber as an airlock during the charging cycle is referred to as a _______ gun.

A. single chamber  
B. continuous feed  
C. double chamber  
D. rotary

16. Positive displacement pumps are capable of maximum placement rates of ______ cubic yards per hour.

A. 8  
B. 10  
C. 16  
D. 18
17. According to Guide to Shotcrete, a rule of thumb is that operating air pressures should not be less than 60 psi when 100 feet or less of material hose is used and the pressure should be increased _______ psi for each additional 50 feet of hose.

A. 5  
B. 10  
C. 15  
D. 20  

18. According to Guide to Shotcrete, the type of mixing equipment that uses a drum mixer with fixed integral blades or rotating paddle with or without an elevating conveyor is referred to as a ______ mixer.

A. wet  
B. continuous  
C. batch  
D. rotary  

19. According to Guide to Shotcrete, air hoses should be constructed to withstand at least ______ times the operating pressure.

A. 1-1/2  
B. 2  
C. 2-1/2  
D. 3  

20. According to Guide to Shotcrete, the minimum inside diameter recommended for all water hoses is:

A. 1/2"  
B. 3/4"  
C. 1"  
D. 1-1/4"  

21. The diameter of a material hose delivering steel fiber-reinforced shotcrete should be a minimum of _______ time the fiber length.

A. 1-1/4  
B. 1-1/2  
C. 1-3/4  
D. 2
22. Positive displacement wet shotcrete is pumped at higher pressures than other methods with pressures ranging from:

A. 200psi to 400psi  
B. 400psi to 600psi  
C. 500psi to 1,000psi  
D. 750psi to 1,250psi

23. In dry-mix shotcrete materials with low moisture content can create static electricity build up which can shock the nozzleman. This problem can be avoided by grounding the gun and using a special _______hose.

A. rubber  
B. antistatic  
C. steel  
D. fiberglass

24. According to Guide to Shotcrete, water booster pumps used in dry-mix applications should have a minimum pressure of _______psi at the nozzle.

A. 60  
B. 65  
C. 70  
D. 75

25. The slump of the wet-mix process shotcrete should generally be the minimum that can be handled by the pump. A slump range of _______inches is normally suitable.

A. 1-1/2 to 3  
B. 3-1/2 to 4  
C. 4-1/2 to 5  
D. 5-1/2 to 6

26. According to Guide to Shotcrete, material supplied from a centrally located ready-mixed concrete plant may be used if the mix can be used within _______minutes of the time of mixing, and preconstruction testing determines the product meets design strengths.

A. 15  
B. 30  
C. 45  
D. 60
27. Shotcrete may be applied in layers or in single thickness. Overhead work is gunned in layers just thick enough to prevent sagging or dropouts, usually ______ inches at a time.

A. 1/2 to 1-1/4  
B. 3/4 to 1-1/2  
C. 1 to 1-1/2  
D. 1 to 2

28. According to Guide to Shotcrete, the distance of the nozzle from the work, usually between _______ feet, should be such as to give best results for work requirements.

A. 2 to 3  
B. 2 to 4  
C. 2 to 5  
D. 2 to 6

29. According to Guide to Shotcrete, the best method for curing is keeping the shotcrete wet continuously for days while maintaining a temperature over 40°F.

A. 3  
B. 5  
C. 6  
D. 7

30. During hot weather shotcreting, material supplied from a centrally located ready-mixed concrete plant may be used if the mix can be used within _______ minutes of the time of mixing.

A. 15  
B. 30  
C. 45  
D. 60

31. According to Guide to Shotcrete, the ideal temperature of shotcrete should be maintained between ________ °F.

A. 40 to 60  
B. 45 to 65  
C. 50 to 90  
D. 50 to 100
32. According to *Guide to Shotcrete*, one advantage of the dry-mix process as compared to the wet mix process is:
   
   A. less dusting and cement loss  
   B. lower rebound during gunning  
   C. capable of being transported longer distances  
   D. higher volume per hose size

33. When sheets of welded wire fabric overlap they should be lapped at least _______ spaces in both directions.
   
   A. one  
   B. one and one-half  
   C. two  
   D. two and one-half

34. ____________ is a technique for applying a thick (over 6") single layer of shotcrete against a vertical surface.
   
   A. Bench shooting  
   B. Angle shooting  
   C. Rolling  
   D. Snap shooting

35. Portland cement conforming to ASTM standard__________ may be used in shotcreting.
   
   A. C150 or C330  
   B. C150 or C595  
   C. C330 or C618  
   D. C494 or C618

36. The feed wheel and rotor of a shotcrete gun should only be cleaned while they are:
   
   A. rotating  
   B. pressurized  
   C. agitating  
   D. stationary

37. Air-entrained wet-mix shotcrete will experience a(n)_______ of slump and a(n)__________ of entrained air when pumped.
   
   A. loss; loss  
   B. loss; gain  
   C. gain; loss  
   D. gain; gain
38. According to the *Guide to Shotcrete*, as a general rule the nozzle should be held perpendicular to the receiving surface but never more than _______ from the surface.

A. 15°  
B. 30°  
C. 45°  
D. 60°

39. When shotcreting overspray and rebound should be:

A. removed  
B. allowed to harden in place  
C. salvaged for later batches  
D. worked back into construction

40. According to the *Guide to Shotcrete*, which method of finishing is not recommended for a fine or smooth finish?

A. rubber float  
B. wood float  
C. brush finish  
D. steel trowel finish

41. Application of shotcrete directly against the ground is acceptable so long as the earth surface is not:

A. moist  
B. compacted  
C. sloped  
D. spongy

42. According to the *Guide to Shotcrete*, finish coats should not exceed a thickness of:

A. 1/4"  
B. 1/2"  
C. 3/4"  
D. 1"

43. In the wet mix process for shotcrete, water is added to the mix:

A. Through a perforated panel  
B. Through a one way valve  
C. At the same time as other ingredients  
D. In the delivery hose by a metered valve
44. Which has the higher compressive strength?

A. Dry mix  
B. Wet mix  
C. Bilateral mix  
D. Compound mix

45. What should operating air pressure for the gun with a 200 ft material hose?

A. 60 psi  
B. 65 psi  
C. 70 psi  
D. 100 psi

46. Which crewmember is in charge of the amount of water in the mix?

A. Pump operator  
B. Laborer  
C. Finisher  
D. Shotcrete engineer

47. What is the recommended spacing for anchors for most applications?

A. 3 feet  
B. 2 inches  
C. 3 inches  
D. 4 inches

48. If shotcrete is to be applied to a porous surface, the surface shall be:

A. Sprayed with salt solution  
B. Kept damp for several hours before application  
C. Painted with polyurethane sealer 10 hours before shotcreting  
D. Coated with an application of keens cement

49. In placing shotcrete for walls, shotcrete application should be commenced:

A. Whenever possible, sections should be gunned to their full design thickness in one layer.  
B. The nozzle should be held perpendicular to the receiving surface, but never more than 45 degrees.  
C. In gunning walls, application should begin at the bottom.  
D. None of the above
50. When slabs are gunned with shotcrete, it is important that the nozzle be held at a slight angle from the perpendicular so that the rebound is:

   A. Back on the concrete being set
   B. Onto the completed portions
   C. Behind the reinforcement
   D. Onto the face of the reinforcement

51. Which finish requires the most effort?

   A. Wood float
   B. Rubber float
   C. Brush
   D. Steel trowel

52. If a pool formed with shotcrete is being installed at below 32 degrees F, heat sources must maintain a temperature above 40 degrees F for a minimum of ____________ days.

   A. 8
   B. 7
   C. 6
   D. 28

53. In curing a pool made of shotcrete, it is highly recommended by ACI that the surface be kept continuously wet for at least ____________ days.

   A. 9
   B. 7
   C. 6
   D. 4
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