1) A 54 in. storm sewer flowing half full, at a velocity of 1.35 Ft./sec., will discharge how much flow into a creek in MGD?

    a)   13.85 MGD
    b)   10.73 MGD
    c)   1.85   MGD
    d)   6.92   MGD

2) Shoring must protude _____ above the top of the excavation.

A) 3 feet
B) 24 inches
C) 18 inches
D) 1 foot

3) A degreasing agent is added to a 16.0 ft. diameter wet well that is 18.4 ft. deep. 4.5 lbs. is required for every 1 ft² of surface area. If the degreaser weighs 8.5 lbs. per gallon and has a concentration of 13.8 mg/l , how many lbs. Of chemical must be added to the well?

a) 16,639.5 lbs.
b) 0.78 lbs.
c) 6,764.3 lbs.
d) 904.3 lbs.

4) In a trench deep enough to require a ladder(s), the worker must not be required to travel more than _____ to get to the ladder

A) Three steps
B) 10 feet
C) 25 feet
D) 15 feet

5) What is the detention time in hours in a tank measuring   312 ft. x 97 ft. x 86 ft. , if the tank
   receives 945,023 GPH?

   a) 22.97 Hours
   b) 2.75 Hours
   c) 20.60 Hours
   d) 12.36 Hours

6)   Any excavation over _____ must have a ladder for the worker to get in and out of the trench

   A) 25 feet long
   B) 4 feet deep
   C) 8 feet deep
   D) 3 feet wide

7) A wet well is   9 feet   deep by 21 feet in diameter. When the pump is not running, the water rises
   33.4 in.   in   3 min.   14 sec. If the level falls   4.5 in. in 10.3 min. while the pump is running,
   what is the pump rate in GPM?

   a) 2,135 Gal./Min.
   b) 2,323 Gal./Min.
   c) 2,380 Gal./Min.
   d) 6,801 Gal./Min.

8)   Given the data below, what is the <u>most</u> likely cause of the lift station problem?

DATA: Wet well inlet is normal
Well drops normally when pump #1 is running
Well level rises slowly when pump #2 or pump #3 is running
Run amperage is the same for all three pumps
One of the pump motors turn backwards when off.
Level system is reading correctly.
Electrical controls are all in automatic.

A) Pump #1 & #2 are air-bound
B) Pump #1 check valve stuck open.
C) Either pump #1 or #2 is wired backwards
D) Check valve on pump #3 is clogged.

9) Sewer "A" has 106,000 people at 95 GPCD. Sewer "B" has 94,875 people at 100 GPCD. Sewer "C" has   88,756 people at 90 GPCD. What percent of the flow is due to I&I if the total plant flow is 43.00 MGD?

a) 43.1%
b) 64.1%
c) 51.2%
d) 35.9%

10)   An engineer must approve any trench shoring design above

A) 4 feet deep
B) A water line
C) 50 feet in length
D) 20 feet deep

11)   All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of

A) 1:1
B) 4 feet
C) 20 feet
D) 1 1/2:1

12)   A certain town's household flow rate is measured at   90 GPCD. If the plant receives   34.25 MGD, but 12% of that is inflow & infiltration, then what is the population of the town?

a) 334,889 People
b) 45,667 People
c) 3,699,000 People
d) 256,875 People

13)   According to "Ten State Standards" When a sewer is installed parallel to a water line, it must be a minimum of
_____ away (measured from the outside diameters)

A) 6 feet
B) 48 inches
C) 36 inches
D) 10 feet

14)   What is the minimum distance from the edge of the spoils to the edge of the trench

A) 10 feet
B) 18 inches
C) 2 feet
D) 6 feet

15) What capacity blower is required to ventilate a manhole   54 in. in diameter and 49 feet deep, if
    8   air change(s) are required every 60 minutes?

    a)   13   Ft^3/Min.
    b)   104   Ft^3/Min.
    c)   6231   Ft^3/Min.
    d)   249   Ft^3/Min.

16)   A(n) _____ is required for any CSO outfall pipe.

    A) Netting facility
    B) NPDES Permit
    C) Outfall flow meter
    D) Monthly inspection

17)   Shoring must protude _____ above the top of the excavation.

    A) 3 feet
    B) 24 inches
    C) 18 inches
    D) 1 foot

18)   A wastewater treatment plant receives the following:

            Pump Station   = 6,500 GPM
            Sewer "A"   = 70,000 People   @ 100 GPCD
            I&I   = 50,000 gal/day
            Ind. Waste   = 92,000 gal/day
            Sewer "B"   =

    If the plant receives 21.5 MGD, what percentage of the total flow is contributedby sewer "B"?

    a) 69.7%
    b) 30.3%
    c) 76.8%
    d) 23.2%

19)   Before any excavation can be done, you must notify_____.

☐ A) The Ohio EPA
☐ B) The Ohio Department of Transportation
☐ C) The County sewer Department
☐ D) The Ohio Utilities Protection Service

20)   The bottom of a water line crossing above a sewer line must be_____ from the crown of the sewer.

☐ A) 18 inches
☐ B) 10 feet
☐ C) 24 inches
☐ D) 3 feet

21)   In keeping records,

☐ A) Every test result should be included in an annual report.
☐ B) Poor records are better than no records
☐ C) Records should be destroyed every two years.
☐ D) Records should be kept up-to-date and maintained as long as they are useful.

22) The interior of   1,750 ft. of 27 in. pipe is uniformly coated with 1.75 in. of grease. How many gallons will this pipe hold when filled with water?

☐   a) 39,408 Gal.
☐   b) 9,337,556 Gal.
☐   c) 43,939 Gal.
☐   d) 7,329,982 Gal.

23) Colored dye is dumped into a manhole. The dye first appears   3 min., 32 sec.   later in a manhole 975 feet downstream and disappears   7 min. and 55 sec. after the dye was first dumped into the manhole. What is the velocity of the flow in the sewer?

    a) 2.05 Ft./Sec.
    b) 2.84 Ft./Sec.
    c) 4.60 Ft./Sec.
    d) 0.70 Ft./Sec.

24)   A mechanical ventilation system for the wet well portion of a lift station which operates continuously should be able to exchange the air in the wet well_____ times an hour

    A) 6
    B) 20
    C) 30
    D) 60

25)   A tanker truck was involved in an accident a few miles upstream from the treatment plant. Storm water inlets to the combined wastewater collection system are receiving a large quantity of an unknown chemical. What is the first action that would be taken?

    A) Determine type of chemical from shipper
    B) Evacuate all homes in the vicinity of the sewer
    C) Immediately instruct treatment plant to start bypassing wastewater.
    D) Warn downstream treatment plant

26) A 480 v   AC pump motor draws   27 amps,   What is the horsepower output of the motor if the power factor is   .77 and the pump efficiency is   81%   ?

    a) 10.84 HP
    b) 14.07 HP
    c) 13.38 HP
    d) 17.37 HP

27)   What is the <u>greatest</u> distance at which manholes should be installed for an 8-inch sewer line?

A) 100 feet.
B) 200 feet.
C) 300 feet.
D) 400 feet.

28)   "Hz" stands for

A) Cycles per second.
B) Hand control.
C) Horizontal phase.
D) Polyphase.

29)   Which of the following are reasonable or valid objectives of a cost accounting program for a wastewater utility?

A) Identify methods or measures for controlling increases in operating costs.
B) Provide data for budget development and preparation.
C) Provide data that helps in making decisions about making repairs verses replacement of equipment.
D) All of the above.

30)   A pump has an efficiency of   80%   and a motor has a power factor of   .91. If the water horsepower is   213 HP and electricity has a cost of   12.3 cents per KWH, how much will it cost to run the pump for one month,   (30 days) at 11.5 hrs./day?

a) $9,262.14 /mo.
b) $7,409.71 /mo.
c) $1,907.29 /mo.
d) $4,975.53 /mo.

31)   Ideally, the pH meter should be standardized

A) Before each use
B) Weekly
C) Monthly
D) Once

32) An automatic chemical feeder treats   67 MGD at a concentration of   73 mg/l.
How many lbs./day of chemical is required?

a) 5,453 lbs./day
b) 36,585 lbs./day
c) 40,791 lbs./day
d) 4,387 lbs./day

33)   Which of the following would be the safest action to take in the event of a <u>major</u> chlorine container leak?

A) Call the fire department to hose down the container.
B) Notify local police or sheriff.
C) Roll the container so that liquid, rather than gas escapes.
D) Submerge the container in a basin or stream if feasible.

34)   Emergency stoppages in pipelines may be cleared safely by use of

A) Bar screens
B) High velocity cleaners
C) TV cameras
D) All of the above

35)   Which of the following are appropriate uses of closed-circuit television by wastewater collection system workers?

A) Chemical addition
B) Evaluating effectiveness of sewer cleaning & clearing techniques
C) Removing sources of infiltration
D) All of the above

36)   35 mg/l. of chlorine is required to treat a flow of   55.3 MGD. The solution available to you, however,
is only 81% of chlorine. How many lbs./day of solution are requires to treat the flow?

       a) 97,802 lbs./day
       b) 19,928 lbs./day
       c) 16,142 lbs./day
       d) 1,172,681 lbs./day

37)   61 mg/l. of root control must be added to a   66 in. sewer that is   3,125 feet long. If the root control
chemical is in a solution that consists of only   41% of   the chemical, how many lbs. of the solution
must be added to the sewer?

       a) 688.75 lbs.
       b) 115.78 lbs.
       c) 767.93 lbs.
       d) 16,672.05 lbs.

38)   Given the data below, what is the <u>most</u> likely cause of the problem?

      DATA: Wet well inlet is normal for dry weather flow
                    Lead pump amperage is lower than normal
                    Lead pump starts at right level, level continues to rise.
                    Lead pump check valve arm remains stationary in lowered position when pump starts
                    Lag pump check valve arm rises when lag pump starts & lowers when it stops.
                    Force main pressure remains the same when lead pump runs, but increases when lag
                    pump runs. Level drops when lag pump runs.
                    Rattling noise coming from lead pump
                    Low-level pressure switch normal
                    High-level pressure switch normal
                    Electrical controls are all in automatic.

  A) Lag pump clogged
  B) Force main pressure too high
  C) Lag pump is air-bound
  D) Lead pump air-bound

39) 73 mg/l. of chemical was previously used to treat a flow of 85,500,500 gal./day. The chemical cost is $3.31 /lb. A chlorine residual test determined that 54 mg/l. of chemical would be satisfactory. How much money would be saved per month by using the 54 mg/l. dose instead of the 73 mg/l. dose?

(1 mo. = 30 days)

a) $1,206,627.17 /mo.
b) $1,345,357.04 /mo.
c) $5,169,003.35 /mo.
d) $3,823,646.31 /mo.

40) Important considerations when reviewing the plans for a lift station include:

A) Access
B) Industrial development potential
C) Trench soil conditions and availability of suitable materials
D) All of the above

41) If the grade of a sanitary sewer has a slope of 0.80% for 445 feet, what is the rise of the pipe?

a)   448.6 Feet
b)   3.56 Feet
c)   0.04 Feet
d)   0.36 Feet

42) What prevents any solution or water from backing up into the chlorine line?

A) Release valve
B) Check valve
C) Auxiliary valve
D) Blow-off valve

43) A(n) 11 ft. wide x 2,150 ft. long trench must be excavated and the spoils removed from the premises. The spoil weighs 2,344 lbs./cu. yd. and each truck can carry 13 tons. How many truck loads are required if the trench is 14.0 feet deep?

a) 2,211 Trucks
b) 1,106 Trucks
c) 3,316 Trucks
d) 1,105 Trucks

44) Estimate the total cost and cost per linear foot of a sewer construction project. The project consists of installin 7 manholes and 3,275 feet of 36 inch sewer Costs are estimated as shown below:

EXCAVATION AND BACKFILL_____ $ 420.00 per foot
COST OF PIPE_____ $ 397.23 per foot
MANHOLE + INSTALLATION_____ $ 4,725.00 each

TOTAL JOB COST:
a) $ 1,408,972.23
b) $ 1,334,003.25
c) $ 2,681,153.25
d) $ 2,709,503.25

COST PER LINEAR FOOT:
a) $407
b) $819
c) $827
d) $430

45) The average cost for contractors to clean the city sewers is $ 5.30 per foot for   2.20 miles of 12 in. pipe,
   $ 6.25 per foot for   2.25 miles of 15 in. pipe, and $ 7.89   per foot for 1.75 miles of 18 in. pipe,
   The city is considering purchasing a new jet & vac truck for $ 312,750 and hiring a 3 man crew to operate it.
   Operator "A" makes $18.43   per hour, operator "B" makes $19.67   per hour, operator "C" makes
    $20.49 per hour. Health care & benefits cost   37% of wages.
               The cost/year of the jet truck will be $ 39,093.75 for 10 years. The time for the crew to clean
   100 feet of sewer is as follows:

12" sewer takes	1.80 hours.
15" sewer takes	3.00 hours.
18" sewer takes	4.25 hours.

   .50 hours. of non-productive time (travel, cleanup, etc.) will be used for every hour spent cleaning sewers
       Which is the least expensive option (contractor or in-house) and by how much over the 10 year period?

   a)   Cheaper to buy a jet-vac, cost savings will be $541,983.87
   b)   Cheaper to contract out, cost savings will be $435,755.03
   c)   Cheaper to buy a jet-vac, cost savings will be $54,469.38
   d)   Cheaper to contract out, cost savings will be $53,656.40

46)   32 mg/l. of chlorine is required to treat a flow of   4.44 MGD.   The solution available to you, however,
       is only 66% of chlorine. If the S.G. of the chemical is   0.94, How many lbs./day of solution are
       requires to treat the flow?

   a) 74,619 lbs./day
   b) 6,223 lbs./day
   c) 1,115 lbs./day
   d) 1,689 lbs./day

47) Prepare a cut sheet for a sewer laid on a   .66 %   grade with the given stake elevations
    and invert grade.   Consider a pipe thickness of   2.3 in. and assume the pipe will be
    installed on 1.0 ft. of bedding.

Station	Stake Elev.	Invert Grade	Cut
0 + 00	67.28	59.00	
0 + 50	67.91		
1 + 00	68.13		
1 + 50	68.55		
1 + 98	69.69		

48) A trench is dug at   8.5 ft. wide x   10.8 ft. deep x 2,235 ft. long. A   27 in. Sewer is going to be installed in
    this trench.   18 in.   must be left out of the top for concrete. How many trucks would be needed if the
     material weighed   3,146 lbs. per yd^3 and each truck carries 14.5 tons?

    a)   675 Trucks
    b)   18,203 Trucks
    c)   789 Trucks
    d)   674 Trucks

49)   Which of the following are accepted means for applying herbicides to control roots in wastewater collection

☐ A) Aeration
☐ B) Foaming
☐ C) Stem injection
☐ D) All of the above.

50) A(n) 54 in. sewer has a flow of 43.75 MGD at a velocity of 2.62 ft./sec. The sewer size changes to a(n) 48 in. sewer with the same slope and flow. Assuming no friction loss, what is the new velocity?
(Both sewers are flowing full.)

☐ a)   5.08 ft./sec.
☐ b)   5.40 ft./sec.
☐ c)   12.56 ft./sec.
☐ d)   3.48 ft./sec.