Lesson 1

Math

1) A pond is 700’ long and 300’ wide with 6’ of depth. How many acres is the pond?

2) A wet well has a diameter of 15’. It contains 2 identical operating pumps. It takes 12 minutes to drop the lift station 6’. With no water entering the station, how many gallons per minute are the pumps?

3) A tank is 85’ long, 40’ wide and 16’ deep. How many square feet, cubic feet, and Gallons does the tank contain?

4) A plant has a flow of 3.3 Mgd, with an influent BOD of 222 mg/l. How many pounds of BOD does the plant take in?

5) An operator makes $5000.00 for a month containing 22 working days. This month the operator only worked 18 days. What would the operator earn for the month?

6) An Imhoff cone test result was 9 mg/l of influent. If the effluent was 0.8 mg/l, what is the percent removal efficiency?

7) Fifty pounds of lime cost $11.00. You need 3000 lbs. of lime. A 25% discount applies to purchases over 30 bags. How much would your lime cost?

8) A tank is 90’ long, 66’ wide and 18’ deep. The tank contains 3’ of Freeboard. How many gallons does the tank contain?

9) A plant has an effluent TSS of 90 lbs. The TSS concentration is 4 mg/l. Find the plant flow in Mgd and Gallons.

10) A plant has a flow of 2222 GPM. The influent BOD is 250 mg/l. How many lbs. of BOD are entering the plant?

11) What is the population equivalent of a town that has an influent BOD of 199mg/l with an effluent BOD of 28 mg/l and a flow of 4 CFS?

Lesson 1

Chapters 1-3

1) Who does a treatment plant operator work for?
   _____ _____ _____
   _____ _____

2) A body of water in which treated or untreated wastewater is discharged is called a _____ _____

3) The wastewater industry has one of the _____ safety records of any industry.

4) Almost 4 in 5 wastewater operators worked for
   _____ _____.

5) What is an operator's main job? _____
   _____.

6) Waste material that may come from plant or animal sources.
   _____ _____.

7) Waste material that are only slightly affected by organisms.
   _____ _____.

8) Bacteria that use dissolved oxygen._____
   _____.

9) Bacteria that live and thrive in an environment with no or very little dissolved oxygen? _____ _____.

10) This process is usually a type of biological treatment._____ _____.

11) _____ _____ units remove the sludge and scum before it reaches the receiving waters.

12) _____ _____ units are designed to use natural organisms such as bacteria for stabilization and removal of organic material.

13) Name some diseases that may be spread through wastewater. _____ _____ _____ _____ _____

14) What does the letters NPDES stand for? _____ _____ _____ _____ _____

15) What are some of the monthly average and monthly levels that the NPDES may specify for? _____ _____ _____ _____ _____

16) This type of sewer carries waste from households and commercial establishments. _____ _____

17) A sewer that collects both sanitary and storm wastes is classified as a _____ _____.

18) Water that enters the sewer through breaks in pipes, open joints or corrosion damaged pipes is called _____.

19) What is usually the water velocity of a sanitary sewer? _____ Fps.

20) What are the two approved methods of getting rid of Screenings? _____ _____

21) Name two devices commonly used for cutting or shredding material. _____ _____

22) What does the devices in Question 21 usually follow? _____

23) What should be the velocity in a properly operating grit channel or chamber? _____FPS.

24) What is the most common flow measuring device? _____

25) Note: Know Section 3.4 Page 42-43 pretty well!

26) What is the velocity of flow reduced to in proper operating clarifiers? _____FPS

27) _____ And _____ are the two types of clarifiers.

28) What is the common detention time in a primary clarifier? _____ To _____ Hrs.

29) Read over Section 3.6 secondary treatment pages 46-47.

30) Where is settled sludge from a clarifier pumped to? _____

31) What is the liquid above the sludge on a digester called? _____

32) Where is the scum blanket located on a digester? _____

33) Digester gas is usually _____percent methane and _____ percent carbon dioxide.

34) Ponds that are 3-6 feet deep and have oxygen throughout are called _____ _____.

35) Ponds that are 8-12 ft. deep and may be without oxygen throughout are called?

36) Ponds that contain an aerobic top layer and an anaerobic bottom layer are called_____.

Lesson 2 Math

1) Convert 1200 GPM to MGD

2) Convert 1.79 MGD to GPM

3) Convert 4 CFS. To MGD

4) Convert 2.59 MGD to CFS.

5) Convert 50 degrees F to C.

6) Convert 90 degrees C to F.

7) Convert 8,555,277 Gallons to MGD

8) Convert 6.177588 Mgd to Gallons

9) If you have an influent BOD of 245 mg/l and a flow of 500, 000 Gallons per day, How many pounds of BOD do you have?

10) If you have an effluent ammonia nitrogen of 2 mg/l and a flow of 2.5 CFS. How many pounds of effluent ammonia do you have?

Chapter 4 Racks, Screens, Comminutors and Grit Removal

1) Does the Wastewater industry have a good safety track record? _____
2) Name some things that make up grit. _____ _____ _____ _____ _____ these things are all considered _____ _____.
3) Septic conditions produce _____ _____ which has a rotten egg odor.

4) Study table 4.1 Page 69 for the exam.

5) Before reaching into a mechanical bar screen, _____ _____ _____.

6) This will break when a certain amount of load or stress is exceeded. _____ _____

7) What are two common methods of disposing of screenings from the bar screen? _____ _____

8) Why have mercury seals been ban in the US?
_____

9) What injects air into an aerated grit chamber? _____

10) What is the heavy coarse mixture of grit and coarse material called? _____

11) What does a grit washer wash out of grit and sand?
_____ _____

12) What is the amount of grit that can be expected from each type of system per Million Gallon?
Separated system _____
Combined System_____

13) Where are some places explosion proof wiring should be installed? _____
_____
_____

Lesson 3 Chapter 5 Sedimentation and Flotation

1) What are the names of sedimentation and Floatation units, and what is the most common name? _____ _____ _____ _____
2) There are 2 types of clarifiers, the _____ clarifier follows the head works, and the _____ clarifier follows the biological treatment in the plant.
3) Study Table 5.1 page 113 for exam.
4) Study Table 5.2 Page 115 for exam.
5) Scraper boards used to move settled sludge or floating scum are called _____.
6) How can algae be removed from a clarifier? _____ _____
7) What is the purpose of a sedimentation tank or clarifier? _____
8) Study The Primary Clarifier Trouble Shooting Guide on Page 121-127.
9) Clouds of billowing sludge that occur when sludge does not settle properly. This is usually caused by filamentous bacteria or bound water._____
10) What is some lab test performed on clarifiers? _____ _____ _____ _____ _____

11) What would the expected clarifier removal efficiencies of the following water quality indicators be:
Settleable Solids_____
Suspended Solids_____
Total Solids_____
BOD_____
Bacteria_____

12) What are the particles that settle to the floor of a clarifier called? _____

13) What is the most important function of a primary clarifier? _____

14) What is a good velocity for a primary clarifier to allow good settling? ___ to _____ Feet per minute

15) When water is not evenly dispersed in a clarifier and some of it can get through without the desired detention time. _____.

16) These remove floc produced by secondary treatment processes. _____

17) Read section 5.620 and 5.621 on pages 138 and 142.

18) Study Section 5.7 Page 142 and 144.

19) Small particles that do not dissolve and remain suspended in water for a long period of time are called _____.

20) A combined sedimentation and digestion units are considered _____.

21) This prevents a flame from traveling down a gas outlet pipe to the top of a digester compartment where a flame could cause an explosion. _____

22) This allows sludge withdraw some the digester can be sampled. _____

Lesson 3 Math

1) Your primary clarifier has an Influent TSS of 24 mg/l. The effluent TSS of the primary clarifier is 2 mg/l. What is the clarifier removal efficiency?

2) You have a clarifier that is 67’ feet long and 34 feet wide with a liquid depth of 18 feet. How many gallons does this clarifier contain?

3) You have a clarifier with a flow of 3.1 Mgd. The clarifier is 100’ long and 50’ wide; it has a depth of 22’. What is the detention time in Hours?

4) A plant has a circular clarifier that is 55 feet in diameter. The clarifier is 12’ deep but has 2 feet of freeboard. Calculate the Square footage and the gallons this tank will contain.

5) What is the area in Square Feet of a clarifier with a diameter of 50’ and a 12’ depth?

6) What is the area in Square foot of a clarifier with a 45’ radius and a 10’ depth?

7) What is the area in Cubic feet of a clarifier with a 57 feet radius and a 22’ liquid depth?

8) You have a circular clarifier with a 60’ diameter and a 20 foot depth, the clarifier has 1.5 feet of freeboard. How many gallons will it contain?

9) A circular clarifier has perpetual weirs 1’ from the wall. The clarifier is 77 feet in diameter and is 22’ deep. It has 2’ of freeboard. Find the volume in :
   Square feet_____
   Cubic feet_____
   Gallons_____

Lesson 4 Ponds

1) What uses dissolved nutrient material such as nitrogen and phosphorus in ponds? _____
2) Study over table 9.1 page 294.
3) Today _____ of all wastewater systems include a pond system.
4) What are some advantages and disadvantages of ponds?

Advantages	Disadvantages

5) A pond with DO distributed throughout is a _____ pond.
6) _____ Ponds have no dissolved oxygen throughout.
7) Ponds with upper portion _____ and the bottom portion _____ are called facultative ponds.
8) What is the most common type of pond in use today?

_____

9) _____is a process in which organisms with the aid of chlorophyll convert carbon dioxide and other inorganic substances to oxygen.

10) What are some suggested ways to reduce odors in a pond?

_____ _____

_____

11) A clean sweep of the _____ will usually keep duckweed from flourishing.

12) What is the last resort for vegetation control of ponds?

_____

13) In order for duckweed to be produced, _____ must penetrate all the way to the bottom of the water, Thus keep at least _____ ft. of water on the pond if possible.

14) Broken stones, boulders, or other material placed on levees or dikes for protection against erosion is called _____.

15) What is probably the most serious maintenance problem associated with ponds?

16) What is Batch Operation? _____

_____

17) Read over the trouble shooting guide on page 310.

18) What is a composite sample? _____

_____

19) What is a grab sample?

20) Read section 9.100 Page 319. Remember the impacts of wind both good and bad.

21) Concerning steepness of the pond slope, a _____ slope erodes quicker unless built out of _____ or

protected by _____, however, a steep slope cuts down on _____.

22) A _____ is a structure to protect soil from erosion by splashing or falling water.

23) What kind of straw can be effective in controlling certain types of algae?

Lesson 4 Math

1) A stabilization pond is 500’ long 300’ wide and has a 5’ depth. The pond receives a flow of 60,000 Gallons per day on average, with a 220 mg/l influent BOD. What is the pond loading in pounds BOD per Acre?

2) A sludge drying bed is 50 feet wide and 80’ long, if the bed is filled 10 inches deep, how many cubic feet of sludge will be added?

3) It takes dye 2 minutes to travel from one manhole to the next. The manholes are 300 ft apart. What is the velocity of the water in feet per second?

4) Is the velocity in number 3 acceptable?

Lesson 5 Disinfection

1) What are disease causing organisms such as bacteria, viruses, and parasites commonly referred to as? _____
2) What is the purpose of disinfection? _____ _____
3) What is the microorganism removal percentages of the following: Chlorine_____, Ozone _____ UV Radiation_____
4) _____ is the destruction of all microorganisms while _____ is the destruction of pathogenic organisms.
5) Organisms that live on dead or decaying matter are called? _____
6) Read section 10.10-section 10.13 pages 349-352
7) The amount of chlorine that has to be added to achieve disinfection is called_____.
8) Chlorine _____ is the amount of chlorine that is left over after disinfection has taken place.
9) The presence of Coliform is a _____ that water is polluted.
10) The addition of chlorine to wastewater at the entrance to a treatment plant is called _____.
11) Look over the Chlorination process controls on page 356.
12) What can be used to detect a chlorine leak? _____ _____

13) An open vertical drop or empty space between a drinking water supply and a non potable water supply to prevent the contamination of the clean water. _____

14) How often should a chlorine storage area be checked for leaks? _____

15) These are used to convert liquid chlorine to gas. _____ _____

16) Give some extra time to Table 10.1 Chlorination Troubleshooting Pages 369-373

17) Chlorine is a gas that is 2.5 times heavier than air. What does this tell you about the gas? _____ _____

18) Study over Table 10.2 page 376.

19) Concentrations of chlorine gas in excess of _____ PPM. May be fatal after a few breaths.

20) Read over the chlorine first aid measures in section 10.43 page 377.

21) What is a safety device on a chlorine cylinder to prevent excessive pressure due to fire or high surrounding temperatures? _____

22) At what temperature does the above safety device melt at? _____degrees F.

23) How many fusible plug openings do most ton tanks contain? _____

24) What happens once a fusible plug melts? _____ _____.

25) When working on chlorine tanks, the wrench you use should not exceed _____ inches in length?

26) Chlorine leaks must be taken care of _____ by trained operators wearing proper _____ _____.

27) Chlorine systems may be tested for tightness using _____ psi dry air.

28) Applying _____ to the outside of joints will detect a leak.

29) If chlorine is escaping from a liquid cylinder, turn the container so that the leaking side is toward the _____.

30) Name three substances that will absorb Chlorine safely.
_____ _____
_____

31) Chlorine evaporators are a hot water heater surrounded by a _____.

32) Table 10.4 Page 393 is worth a long look for the test!

33) _____ is used to inhibit the growth of odor producing bacteria and to destroy hydrogen sulfide.

34) What is the removal of chlorine from treatment plant effluents called? _____

35) What are the four sulfur compounds that can remove chlorine?
_____ _____
_____ _____

36) Sulfur dioxide forms _____ _____
In the presence of moisture and becomes corrosive.

37) Sulfur dioxide is neither flammable or _____
in a liquid or gas form it is colorless.

38) Study table 10.5 0n page 403.

39) The best way to detect a sulfur dioxide leak is with
_____ much the same as chlorine.

40) Study over section 10.924 First aid Response on page 404.

41) A sulfonator is a sulfur dioxide _____ metering device.

Lesson 5 Math

1) Convert to MGD
   3.5 CFS.

   2475 GPM

2) Convert to GPM
   3.3 MGD

   2.5 MGD

3) Convert to CFS

   1.1 MGD

   3.3 MGD

4) An influent Imhoff cone test was 8 ml/l. The effluent for the test was 0.5 ml/l. What is the removal efficiency?

5) 50 pounds of lime cost $ 8.75. If you purchase 25 bags you get a 20 percent discount. You need 1500 lbs. What would you pay for the lime?

6) A plant is discharging 315 pounds of TSS per day. If the Effluent TSS is 4 mg/l. What would the flow to the plant be?

7) The sewer plant operator missed 3 days of work this month. The month had 23 working days. What was the percent of time the operator was working?

8) The wastewater plant operator makes $ 3000.00 per month. If there were 24 working days this month and the operator missed 5 days, What would his check be?

9) A system is applying 9 lbs of chlorine each day. The flow is 1.55 MGD. How many mg/l of chlorine are in the plant effluent?

10) A wet well is 30’ in diameter. With 2 identical pumps operating, it takes 10 minutes to lower the water level 10’. With no water entering the wet well, what is the capacity of the pump in GPM?

11) If 3000 gallons of 4.5 percent solids was pumped to you sludge drying bed, How many pounds of solids were Pumped?

12) Convert 4 CFS to GPM

Math Blitz

1) A clarifier is 80’ long 40’ wide and 15’ deep. The flow is 2.2 MGD. The clarifier has 2 troughs with weirs on both sides. Calculate the weir overflow rate.

2) A clarifier has a radius of 50’ and a 12’ depth. The clarifier flow is 4,800,000 Gallons per day. Find the Detention Time.

3) Each person on a sewer system generates about 1 cubic ft. of digester gas per day. Your town contains 1000 homes and 3.5 residents per home. The digester at the wastewater plant is producing 2750Cubic feet of digester gas in which 72 percent is methane. How many cubic feet of methane gas per person is the digester producing each day?

4) A Clarifier has a 75’ diameter with a 10’ diameter center well. The flow is 2.5 MGD. Find the surface settling rate. (Surface settling rate and surface loading rate use the same formula).

5) A plant has a flow of 3.5 MGD with an influent BOD of 275 mg/l. How many pounds of BOD are entering the plant?

6) A plant is discharging 50 pounds of TSS into a receiving stream. The TSS concentration is 4 mg/l. What is the plant flow in Gallons?

7) The flow into your plant is 1.8 MGD. If you receive 0.6 Cubic feet of grit for every 1 MGD of flow, how much grit will you remove each day?

8) You have a tank that is 200’ long, 100’ wide and 15’ deep. Calculate the volume in Square Feet, Cubic Feet, and Gallons.

9) An Imhoff cone result was 9 ml/l for the plant influent. The effluent test result was 1 ml/l. What is the percent removal efficiency?

10) A pond is 1000’ long by 750’ wide and 6’ deep. Find the surface acres of the pond.

11) If the above pond has an influent BOD of 250 mg/l and a flow of 1200 GPM, What is the pounds BOD per acre per day?

12) Your NPDES permit allows your plant to discharge 800 pounds of BOD. The effluent BOD is 10.5 mg/l. The average monthly flow to the plant was 2.85 MGD and the flow on the sample date was 3.05 MGD. How many pounds of BOD would be reported on your DMR for the month?

13) A wetwell is 12’ long 10’ wide and 20’ deep. The lift station has two identical pumps that pump at the same time. There is a constant flow of 50 GPM entering the wetwell. What is the capacity of the pumps if it takes 25 minutes to pump the station down?

14) The wastewater plant needs a residual chlorine of 0.5 mg/l. The chlorine dose is 5.5. If the plant flow is 1.88 MGD, How many lbs. of chlorine must be fed?

15) There are 23 working days this month. The operator only worked 18 days. What is the percentage of time the operator was off?

16) The plant clarifier is 50’ in radius and 15’ deep. The flow is 1.5 MGD. Find the surface loading rate.

17) Your plant has a influent TKN of 25 mg/l. The NPDES permit calls for a effluent TKN of 2.5 mg/l. What removal efficiency must be achieved to meet this requirement?

18) A chemical you are to purchase cost $ 250.00 per bucket. The vendor tells you if you purchase 3 buckets you can get a 20% discount. What will 5 buckets cost?

Lesson 6 DMR

1) The DMR is a part of the NPDES permit.

2) On some permits, the DMR form the facility is to use changes from winter to summer, the correct form must be sent to correspond with the month. Now the DMR's are submitted electronically so getting the wrong one would be difficult. Just make sure you are testing the correct parameters for the month.

3) The DMR form must be submitted on the required time frame. (Example: Monthly, Quarterly, Every 6 months or Yearly)

4) The DMR must be submitted mo later than the 20th day of the month that it is due. This can be a violation if it is late. If for some reason it is to be late, WVDEP should be informed in writing of the delay.

5) The permits of facilities over 1 MGD must also be submitted to EPA Region III in Philadelphia PA. Your DMR will tell you if you must send them here also.

6) DMR's must be signed by the Chief Executive officer or the ranking elected official of the system. If someone else is to sign, there must be a signed letter submitted declaring the signer.

7) The ES-59 form must also be submitted with DMR. This form is actually required by the WV Dept. of Health.

Laboratory

1) Why is the laboratory analyses performed?
   A) Required by the NPDES Permit
   B) Wastewater Plants are Monitored by state agencies such as the WVDEP, Health Dept. and a Federal Agency in the USEPA
   C) To see if your plant equipment and process are operating correctly and to determine if adjustments are necessary.
   D) These analyses are necessary to report on the DMR. If you have undesirable results, go ahead and report them. Never, ever, ever, falsify anything.
   E) Necessary to maintain knowledge of what a treatment plant is doing so the operator may make necessary adjustments (process control).

2) Types of Samples
   A) A **composite sample** is several individual samples collected and recorded at regular intervals, which gives a representation of a large time frame. Most of the time the samples have to be flow proportional. This means that the flow at the time the sample is to be collected determines how much sample is to be collected.

B) A **Grab Sample** is one sample collected and analyzed in less than 15 minutes. The sample must be collected at a point where the water is well mixed and a good representation of the condition at the time.

C) Some analyses that require composite samples are: BOD, TKN, Ammonia, TSS, and most Metals.

D) Some analyses that use grab samples are: Fecal Coliform, Chlorine Residual, PH, and DO. It is preferred that all of the grab samples mentioned above, except for Fecal Coliform, be analyzed directly in the body of water or tank.

3) The system must refer to their NPDES to determine the frequency of sampling of each parameter. Usually, PH, DO, Flow, Chlorine Residual, and Temp. must be recorded daily. BOD, TKN, Ammonia, TSS and any medals the system would have to test would be either weekly, monthly, quarterly, two per year, or yearly. Refer to your NPDES permit for the sample frequency of these.

4) Laboratory Safety

A) Always pour acid into water, never pour water into acid.

B) Wear proper safety equipment in the lab.

C) Never eat, drink, or smoke in the lab

D) Dispose of any broken or chipped glass wear as soon as you notice it.

E) Make sure to know where fire extinguishers are located.

F) Know where the eye wash stations are located.

G) Always wear gloves and wash your hands often with soap and as hot a water as you can take.

5) Tests Analyzed Dailey

A) **PH** by definition is an expression of the intensity of the basic or acidic condition of a liquid. Mathematically PH is the logarithm (base 10) of the reciprocal of the hydrogen ion activity.

The PH scale goes from 1-14, 7 are considered neutral. 1-7 is acidic, 7-14 is basic. PH may be affected by temperature. The PH probe needs to be temperature compensated to adjust for temperature.

B) **Flow** is a measurement of the amount of water entering or exiting a plant each day. For DMR purposes, flow is usually converted to MGD. The flow is usually taken from a flow meter or totalizer. The daily flow must be recorded on the DMR.

C) **Settleable Matter** is a test that will show the amount of Settleable Matter present in wastewater.

D) **Chlorine Residual** is a test that shows the amount of chlorine remaining after the chlorine demand of the water has been satisfied.

E) **Dissolved Oxygen** is the measurement of the amount of oxygen that is present in water. Most DO test are taken with a DO Meter. Sometimes the Winkler method is used. This is a titration method in which a white floc indicates no oxygen is present. The results are recorded on the ES-59. The sample should be analyzed in the tank if possible.

6) <u>Test on a weekly, monthly, quarterly, yearly and 2 per year basis</u>

A) **Fecal Coliform** is an analysis of bacteria that may be present in water and be harmful to humans. Fecal Coliform is present in

the gut of all living animals. Fecal Coliform is an indicator that conditions is right for pathogens to be present.

B) The **BOD** test is a test that measures the rate of oxygen use under controlled conditions of time and temperatures. Standard test conditions include a 5 day, dark incubation period at a temperature of 20 degrees Celsius.

C) **TKN or Ammonia Nitrogen** is the measurement of the amount of nitrogen or ammonia as nitrogen that is present in water. Excessive amounts of nitrogen in the water can prove fatal to aquatic life and can cause death to infants.

D) **Total Suspended Solids** is a test that analyses the amount of suspended matter in water.

7) <u>Basic Laboratory Equipment</u>
   A) BOD Incubator 20°C
   B) Water Bath 44.5°C
   C) Drying Oven 103°C
   D) Muffler Furnace 550°C
   E) Sample Refrigerator 4°C
   F) Autoclave 121°C

Lesson 7 Sludge Digestion

1) What piece of equipment is floating scum and settled sludge from Clarifiers and commonly pumped to? _____

2) Saphrophytic organisms are referred to as _____ _____.
3) Methane Fermenters require a PH range of _____-_____ to reproduce.
4) In a digester you want the acid formation and the methane formation about _____.
5) I would Know the 7 items mixing accomplishes at the top of page 151 on the left.
6) Psychrophilic Bacteria have a temperature range of ____ - _____°F.
7) Mesophilic Bacteria have a temperature range of _____ -- _____°F.
8) Thermophilic Bacteria have an optimum Temperature range of _____--_____°F. They are above 113°F if they are in this range.
9) Never change the temperature in a digester more than _____ degrees per day.
10) The liquid between the sludge on the bottom and the scum on the top of a digester is called _____.
11) Most fixed cover digesters are designed to only allow a pressure of _____ inches of water column height but some are designed to allow up to _____ inches.
12) What will happen if the pressure is exceeded? _____ _____ thus allowing air to enter the tank and form a mixture of explosive gases.
13) The floating cover travels up and down with the level of the tank and _____.

14) Study over Table 12.1 Page 153

15) Relieves excessive vacuums so the digester cover will not collapse. _____

16) Relieves excessive pressure in a digester so the water seal will not be blown out. _____

17) Prevents spark or flame from entering the digester. _____

18) What is the range of Methane gas in a well operating digester? _____ ----- _____%.

19) What is the range of carbon dioxide in a well operating digester? _____-----_____%

20) What is the point in the digester roof where the digester gas is removed called? _____

21) Read section 12.121 Page 158 and 162 very well!

22) Read section 12.122 very well!

23) How often should drip traps be drained? _____

24) This is a meter to indicate gas pressure. _____

25) A sampling well or thief hole is always submerged _____ft into the sludge.

26) Read over section 12.14 on the heating page 166 and 176.

27) These stick out from the digester wall and provide support and will allow a floating cover to go no lower. _____

28) These prevent the cover from scraping the side walls or rotating in the tank. _____

29) This is the space full of digesting sludge between the floating cover and the digester side wall. _____

30) How would scum be controlled in a digester? _____ and _____

31) The volatile solids content of waste activated sludge removed from the digester is _____--_____%.

32) A sour digester usually requires _____---------_____ days to recover.

33) What is seed sludge? _____

34) Development of a cone shaped flow of liquid like a whirlpool through sludge is called _____.

35) Digester sludge is considered thin if it contains less than _____% solids.

36) Sludge with concentrations greater than _____ to _____% usually will not digest well in conventional digestion tanks.

37) The recovery time of a sour digester can be speeded up by the addition of a _____ such as soda ash or lime.

38) Neutralizing a sour digester _____cure the cause of the upset it will only bring the PH to a suitable level.

39) The withdrawal rate of sludge from a digester should be no faster than the rate that gas production is able to maintain a _____.

40) If sludge draw off is too fast and a negative pressure develops, this may create an _____ hazard by drawing _____ into the digester.

41) What is the key to successful digester operation? _____

_____.

42) As long as the volatile stays _____ and the _____ stays high anaerobic digestion will take place in the digester.

43) Although each plant will have its own volatile acids/alkalinity relationship, less than _____ is generally a pretty good place.

44) The volatile acids/alkalinity relationship is a indication of the _____ capacity of the digester.

45) What % of CO_2 would you want in a digester? _____to_____%

46) ____ is a poor indicator of impending problems in a digester because it is usually the last indicator to change.

47) When pumping sludge to a digester, pump as _____ of a sludge as possible.

48) Pump small amounts of sludge at regular intervals to prevent adding to much _____ _____ to fast.

49) In a digester, _____ needs to remain pretty constant.

50) Digesters should be well _____ to provide a even distribution of food, heat, and organisms.

51) Look over the chart on pages 206-211

52) The normal interval for cleaning anaerobic digesters is from _____ - _____ years.

53) The digester should be cleaned when about _____ of the capacity is filled.

54) Always provide good _____ before entering a digester.

55) _____ _____ procedures should be followed before entering and while occupying digester.

56) Of the two types of digestion, _____ digestion has higher equipment cost, but _____ digestion has higher operating costs.

57) What is used to maintain aerobic conditions in a aerobic digester? _____ and _____ mixing.

58) _____ _____ is a condition which living organisms oxidize some of their own cellular mass instead of new organic matter that they absorb from the environment.

Lesson 8 Safety Chapter 14

1) As a individual, you can be held _____ for injuries or property damage that result from a unsafe condition that through reasonable diligence you could have know of.
2) Accidents do not just happen, they are _____.
3) A person capable of identifying hazards and unsanitary or unsafe conditions and has the authority to take corrective action referred to as a _____ _____.

4) Always wash your _____ before eating or smoking and wear proper protective gloves when you are going to be in contact with wastewater or sludge.

5) Section 14.12 Page 266-270 I would read this **TWICE!**

6) At What concentration can oxygen be dangerous? _____% It speeds up combustion after this concentration.

7) Air has a specific gravity of 1, any gas with a specific gravity more than 1 may _____ to low areas because they are heavier than air.

8) An document that provides important information and profile of a hazardous material is a _____.

9) Fire Extinguishers should have hydrostatic testing every ___ to ____ years depending on the type of extinguisher. They should be serviced promptly after each use so they are ready for the next time.

10) Study over the Basic Lockout/Tag out Procedures on pages 274-277.

11) What has a scale of 0-130 and expresses the intensity of sound?

_____

12) What is the abbreviation for the answer to question 11? _____

13) List the four most common respirators:

_____

_____

_____

_____

14) List the five areas that traffic control zones can be divided into:

_____

_____

_____

_____

_____

15) Never enter a manhole without fully complying with all _____ _____ Procedures.

16) Before excavating, contact utility companies to _____ any underground utility lines.

17) A complete framework of wood or metal that is designed to support the walls of a trench is called _____.

18) _____ is the use of a two sided, braced steel box open on the top, bottom and ends.

19) Slope or bench about ___ ft. back for every ____ft. of depth on each sides of the excavation.

20) What type of fire extinguishers are recommended for pump stations? _____ _____.

21) Good housekeeping is a very good way of preventing _____ in areas that get water, grease and slime around them.

22) _____ or _____ is the biggest hazard when working on or around a clarifier.

23) What is a class I, division 1 location? _____

_____.

24) Before attempting to relight a _____ _____ _____, make sure the main valve is turned off and the stack has been allowed to vent for a few minutes.

25) Never go out on a pond when you are _____.

26) When working from a boat, one should always wear a _____ _____ _____ _____.

27) What are the two most common causes of accidents with chlorine and sulfur dioxide? _____ _____

28) What is one of the biggest safety hazards with polymer? _____

29) What is the most common toxic gas encountered by operators? _____ _____

30) Always wear disposable _____ when collecting samples.

31) Always work under a _____ _____when working with chemicals that give off toxic fumes.

32) Do not pipet chemicals by _____ always use a bulb.

33) _____ _____ is the single most cause of accidents in the lab.

34) Know the classes of fire extinguishers in section 14.41 pages 303 and 304.

Lesson 9 Chapter 15 Maintenance

1) Do not rely on memory in regards to your preventive maintenance program, _____ everything you do.

2) What does most water tanks contain to prevent them from floating because of ground water? _____The tanks would float when they are empty not when full.

3) Many people judge the ability of the _____ by the appearance of the plant grounds this sometimes includes management.

4) A green or reddish deposit on metal indicates a _____ leak.

5) _____ will detect a chlorine leak.

6) A _____ _____ is basically an impeller rotating in a casing.

7) The liquid in a pump moves through the _____ which is at the center of the impeller.

8) What is used to protect the shaft of a centrifugal pump

_____

9) Excessive amounts of _____ can harm antifriction bearings.

10) What is used to connect the shaft to the motor? _____

_____

11) _____ _____ need to be in pumps to plug internal liquid leakage.