What do I need to know to pass an Advanced Industrial Wastewater License Test?

[Activated sludge, metals finishing, sedimentation/clarification with chemicals, DAF]

All of the Basic Industrial Wastewater NTK plus the following:

**Industrial Waste Treatment Volume 1 (Third Edition)**

**Regulations Chapter 3**

Pretreatment standards and regulations – 3.2 – 3.3

- What is the purpose of the General Pretreatment Regulations?
- Pretreatment regulations regulate pollutants that may do what?
- What are the conventional pollutants?
- Who is required to develop a pretreatment program?
- Define “significant industrial user”.
- What is a “baseline monitoring report” and what is required in it?
- Describe general and specific prohibitions.
- What are toxic pollutants?
- Describe BPT and BAT.
- What are the two main different types of categorical standards?
- What information is required in a periodic compliance report?

**RCRA – 3.5**

- What are RCRA’s primary goals?
- What are some of RCRA’s exemptions?

**Clean Water Act – 3.55**

- What stormwater discharges require permitting under the NPDES?

**Industrial Monitoring Chapter 5**

- Confined Space

**Flow Measurement Chapter 6**

Hydraulic and instrument calibration – 6.5 – 6.51

- What are the basic methods for checking the accuracy of flow metering?

**Flows to measure – 6.6**

Flow proportioned samples – 6.7

- When should composite samples be obtained?
- Describe flow-proportioned composite sampling.
Preliminary Treatment Chapter 7

Flow equalization tanks: types, mixing, and shapes-Lesson 1, 7.2
- What are the two purposes of mixing?
- Define “short-circuiting”.
- Describe some of the advantages/disadvantages of the different shapes of tanks.

Types of screens – Lesson 2, 7.51
- Why is screening used to pretreat industrial wastewater?
- What types of solids can be effectively screened?
- What are coarse screens also called and why are they used?
- How are coarse screens usually cleaned?
- What is the purpose of fine screens?
- Why are static screens popular in industrial wastewater treatment?
- How are static screens cleaned?
- Describe the different types of rotating screens and what types of waste they are best suited to handle.

pH adjustment – Lesson 3, 7.7 – 7.9
- Explain the pH logarithmic scale.
- What is used to bring pH within a general range?
- What is used to “fine tune” pH?
- pH adjustment is also dependent upon what?
- What three elements contribute to a successful pH control strategy?
- Wastewaters may self-neutralize if there is enough what?
- What is the most important part of pH adjustment?
- What could happen if proper pH mixing does not occur?
- What is “dead time”?
- What affects dead time?
- What are the two types of mixing?
- For good intermixing, when should the reagent be added to wastewater?
- Residence time is dependent upon what?

Physical-Chemical Treatment Processes – Chapter 8

Solids removal using chemicals – Lesson 1, 8.1
- What are the three steps in physical-chemical treatment?
- Define coagulation and flocculation.
- How is pinpoint floc formed?
- What is the purpose of flocculation?
- Why is chemical coagulation used?
- Addition of chemicals usually creates more what?

Coagulation/flocculation – 8.2
What is coagulation?
Fine suspended solids particles tend to accumulate what?
Define electrostatic repulsion and coordination sphere formation.
How is electrostatic charge reduction accomplished?
Why is the initial process of rapid mix important?
Why is the speed of paddles in rapid mix tanks important?
Describe flocculation.
What should be avoided during flocculation?
How do polymers aid flocculation?

Coagulation aids/chemicals used to improve settling – Lesson 2, 8.3
What are the four most common chemicals added to improve settling of solids?
What are some general safety precautions when using chemicals?

Polyelectrolytes/polymers – 8.34
Describe polyelectrolytes.
How are synthetic polyelectrolytes classified?
Why are polyelectrolytes used in small doses?
What cautions should be taken when handling polyelectrolytes?

Dosages and jar testing – 8.4 – 8.41
What are some of the factors that should be considered when selecting chemicals?
What is the most valuable tool in controlling and operating a chemical treatment process?
Describe the jar test procedure.

Clarifiers – Lesson 3, 8.54
The two basic configurations of clarifiers are based upon what?
What is one advantage of vertical-flow clarifiers?
What are some physical characteristics that can affect clarifier efficiency?
Define “short-circuiting” and some of the causes.

Treatment of Metal Wastestreams – Chapter 11

Methods and sources of metal wastestreams – Lesson 1, 11.0 11.1
Why can’t metal wastestreams be treated with biological processes?
What is a refractory chemical and how is it usually handled?
What are some of the procedures for reducing waste treatment costs?

Types of metal wastestreams
What are chelating agents and how do they affect wastestreams?
What are “spent baths” and what are the two options for treating them?
Why are dilute rinse waters easier to treat?
How and where are valuable metals (gold, silver, etc.) treated?
Why do cyanide and hexavalent chromium require special treatment?
Treatment processes – 11.3
- What is essential to ensure completion of chemical reactions?
- Precise and accurate control of what is important in physical-chemical reactions?

Batch and continuous process – 11.30
- Batch processes are usually used when dealing with what kind of wastewater flows?
- What kind of processes are easier to control?
- Many operators consider what process as the simplest and most dependable?
- Batch treatment is an effective way to handle what that could overwhelm a continuous process system?
- Continuous flow treatment facilities are used to treat what?

Neutralization – 11.31
- Neutralization of strongly what is required before they are discharged?
- Wastewaters with high pH are neutralized by the addition of what?
- Wastewaters with low pH are neutralized by the addition of what?
- What precautions should be taken when using strong acids or bases?

Common metals removal – 11.32
- Common metals can be removed from wastestreams by what two methods?
- Why must hexavalent chromium and cyanide wastes be removed before other metals?
- What is commonly used when treating wastestreams with different optimum pH levels?
- What are some limitations of the hydroxide precipitation process?

Complexed metals – ll.33
- Why are complexed metals difficult to treat?
- How can complexed metals be treated?
- Explain high pH precipitation.
- Explain the chemical reduction process.

Reduction of hexavalent chromium – 11.34
- Why does hexavalent chromium have to be converted to trivalent chromium?
- How can hexavalent chromium be converted to trivalent chromium?

Cyanide reduction by oxidation – 11.35
- What precautions must be taken during cyanide destruction and why?
- What is the most practical and economical method of treating cyanide wastes?

Precious metals recovery – 11.36

Oily wastes – 11.37
What are the principal reasons to minimize the discharge of oily wastes from a wastestream?
- What is the source of oily wastes?
- What are the three types of oily wastes?
- What can be used to separate free or floating oils from the wastestream?
- How are emulsified oils treated?

Process instrumentation and controls – Lesson 2, 11.4

Metallic sludge and dewatering – 11.5
- What are some common methods used to dewater metallic sludge?
- What are some of the advantages of filter presses?

Safety – Chapter 13

Lockout/tagout procedures – 13.190
- What are the basic lockout/tagout procedures?
- What is a tagout device?

Excavations – 13.202

Laboratory – Lesson 3, 13.3
- Safety precautions when collecting wastewater samples.
- Labels for chemical containers should have what information?
- What is the largest single cause of accidents in the lab?
- Why should you always wash your hands before eating?
- Which is put in a container first-acid or water?
- Why should chemicals and reagents be handled with care?
- What protective equipment should be worn in the lab?

Fire prevention – 13.4
- What three ingredients are needed for a fire?
- Describe the four classes of fire.
- List some fire prevention practices.

Safety equipment and procedures – 13.6
- What emergency phone numbers should be listed in a noticeable place?

OSHA – 13.12
- What is OSHA and what is it designed to protect?

Industrial Waste Treatment Volume II, (Second Edition):

Activated Sludge Process Control – Chapter 3
Description of process – Lesson 1, 3.0
- Describe the activated sludge process.
- Activated sludge is also known as what?
- Define stabilization and oxidation.
- What must the operator control for the activated sludge process to work properly?
- An increase in organisms in an aeration tank will require greater amounts of what?
- What is an essential control test in an aeration tank?
- What happens in an aeration tank if the DO is too low or too high?
- What is another important control technique in the aeration tank?
- What is RAS?
- What is WAS?

Aeration systems – 3.01
- What is/are the purpose(s) of aeration?
- What are the two methods commonly used to disperse oxygen?
- What are two examples of surface aerators?
- How is oxygen transfer accomplished in surface aeration?
- Describe turbine aeration.
- What is the most common type of aeration system?
- Describe diffused aeration systems.
- Why does compressed air need to be clean?
- Describe positive displacement blowers and its components.
- Describe a centrifugal blower and its components.
- What are the three types of diffusers commonly used today?

Variations of activated sludge process – 3.02
- What are the three most common activated sludge variations?
- Describe contact stabilization, step-feed aeration, and complete mix.

Return activated sludge – Lesson 2, 3.2
- What is the purpose of returning activated sludge?
- How can RAS be controlled?
- What is the advantage of a constant RAS flow control and where is it an advantage?
- Compare RAS control approaches.
- What are the most commonly used techniques in RAS?
- What are some methods to check the sludge blanket depth?
- At what depth should the sludge blanket depth be kept?
- When should the sludge blanket depth be measured and why?
- Define the 30 minute settleability test.
- Define sludge volume index.

Waste activated sludge – 3.3
- What is the purpose of wasting activated sludge?
- The amount of WAS affects what items?
• Define growth rate.
• Which process controls can be used to control WAS?

Methods of sludge dewatering – 3.31
• Define sludge age and commonly experienced difficulties.
• What facts need to be remembered concerning F/M ratio?
• What does MCRT represent?
• Define nitrification.
• Why is MLVSS used by operators for process control?

Activated sludge microbiology – 3.32

Factors affecting biological treatment of industrial waste – Lesson 3, 3.6 – 3.61
• What are common types of industrial contaminants and their possible effects?
• What are some of the common adverse effects that industrial waste constituents have on unit processes?

Arkansas Regulation 3

Wastewater Math (Reference formula sheet)
Be able to calculate:
• Sludge age
• F/M ratio
• MCRT
• MLSS
• MLVSS
• RAS
• SVI
• WAS flow rate
• Detention time
• Surface loading rate
• Weir overflow rate
• Solids loading
• Chemical Dosage problems

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