



Certification Boulevard

Roy Pelletier



Test Your Knowledge of Miscellaneous Wastewater Treatment Topics

- What does the term "absorption" mean?
 - To impregnate a liquid with air.
 - The taking in of one substance into the body of another.
 - To gather onto the surface of a substance.
 - To stick like fly paper.
- What component is used to convert liquid chlorine into chlorine gas?
 - Expander
 - Evaporator
 - Liquefier
 - Vacuum regulator
- Which type of solid is typically the highest percentage in the total solids profile of raw wastewater?
 - Suspended
 - Dissolved
 - Colloidal
 - Settleable
- What is another term for organic solids?
 - Volatile
 - Non-Volatile
 - Dissolved
 - Soluble
- What is the term when ammonia-N and organic-N are added together?
 - TKN
 - SON
 - TN
 - NO_x
- What is the closest hydraulic loading equivalent in domestic wastewater?
 - About 1.0 lb TSS per capita per day.
 - About 1.17 lbs CBOD₅ per capita per day.
 - About 100 to 150 gals per capita per day.
 - About 20 to 27 lbs NH₃ per capita per day.
- What is the term used when chlorine reacts with ammonia and forms chloramines?
 - Nitrification
 - Combined residual
 - Breakpoint chlorination
 - Oxidation reduction potential
- What is the term used when ammonia-N, nitrate-N and nitrite-N are added together?
 - TKN
 - SON
 - TN
 - TIN
- Given the following data, calculate the oxygen uptake rate (OUR) in mg/L/hr.
 - Beginning D.O. is 7.2 mg/L.
 - Ending D.O. is 4.5 mg/L.
 - Test Time is 10 minutes.
 - 27.5 mg/L/hr
 - 16.2 mg/L/hr
 - 35.8 mg/L/hr
 - 9.2 mg/L/hr

- Select the closest oxygen demand value, in lbs of O₂ for each pound of CBOD₅ oxidized or converted:
 - 0.1 to 0.5
 - 0.8 to 1.2
 - 4.0 to 5.0
 - 5.0 to 10.0

ANSWERS ON PAGE 58

SEND US YOUR QUESTIONS FOR CERTIFICATION BOULEVARD

Do you have a question or an exercise you would like to feature in "Certification Boulevard?" We'll be glad to publish it. Just send your question (with the answer) or your exercise (with the solution) to:

Roy A. Pelletier, Wastewater Consultant
City of Orlando Public Works Department
Environmental Services Wastewater Division
5100 L.B. McLeod Road, Orlando, FL 32811
roy.pelletier@cityoforlando.net
Telephone 407-716-2971

There is no limit to the number of questions or exercises you may submit. Please include your name, city, and organization or company so we can give you credit.

Looking for Answers? Read 'Certification Boulevard Questions from Past Issues

Are you new to the water and wastewater field? Want to boost your knowledge about topics you'll face each day as a water/wastewater professional?

All past editions of Certification Boulevard back through July 2000 are available on the Florida Water Environment Association's Web site at <http://www.fwea.org/dynamics.asp?id=109>. Click the 'SITE MAP' button on the home page, then scroll down the list until you reach the Certification Boulevard Archives under the Operations Research Committee. The archives contain all Certification Boulevard questions and answers dating from 2007 back to July 2000.

Certification Boulevard Answer Key

From page 37

1. **B. The taking in of one substance into the body of another.**

Absorption:

1. The act or process of absorbing or sucking in anything.
2. The act or process of being absorbed and made to disappear.
the absorption of bodies in a whirlpool
the absorption of a smaller tribe into a larger
3. (chemistry, physics) An imbibing or reception by molecular or chemical action.
the absorption of light, heat, electricity, etc.
4. (physiology) In living organisms, the process by which the materials of growth and nutrition are absorbed and conveyed to the tissues and organs.
5. Entire engrossment or occupation of the mind.
absorption in some employment

2. **B. Evaporator**

A typical evaporator contains a heated water bath with tubes where liquid chlorine is conveyed through the heated bath to accomplish conversion of liquid to gas (evaporation). The design is such that the liquid chlorine never comes in direct contact (is not mixed) with the heated water.

3. **B. Dissolved**

Typically, the dissolved solids fraction is about 80% of the overall total solids concentration.

4. **A. Volatile**

5. **A. TKN**

TKN ... Total Kjeldahl Nitrogen ... is the combination of ammonia-nitrogen and organic-nitrogen. Typically, the majority of TKN of domestic raw wastewater is in the ammonia form.

6. **C. About 100 to 150 gals per capita per day**

7. **B. Combined Residual**

Combined Chlorine is that fraction of the total chlorine which is present in the form of chloramines or organic chloramines. In other words: Chlorine that is bound to other elements or organic compounds but is still an effective disinfectant. Combined chlorine has been found to be more effective than free chlorine in controlling post-disinfection bacterial growth. Chloramines are an example of combined chlorine.

8. **D. TIN**

TIN stands for "Total Inorganic Nitrogen" and is the combination of all forms of nitrogen except organic nitrogen.

9. **B. 16.2 mg/L/hr**

OUR Formula, mg/L/hr:

$$\begin{aligned} &[(\text{Beginning D.O., mg/L} - \text{Ending D.O., mg/L}) \div \\ &\text{Test Time, minutes}] \times 60 \text{ minutes/hour} \\ &= [(7.2 \text{ mg/L} - 4.5 \text{ mg/L}) \div 10 \text{ minutes}] \times 60 \\ &\text{minutes/hour} \\ &= 16.2 \text{ mg/L/hour} \end{aligned}$$

10. **B. 0.8 to 1.2**

Basically, it takes about one pound of oxygen to convert (or oxidize) one pound of CBODs.