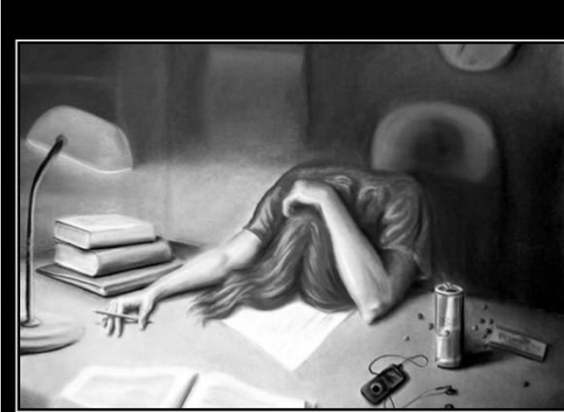


## Studying for OpCert exams (specializing in Laboratory)

**Rick Mealy**  
**George Bowman**  
- DNR Lab Certification



**STUDYING**  
Notice how they conveniently put "DYING" at the end of this word.

## Clean Slate Protocol



### Score required to PASS

75% ⇒ 76%

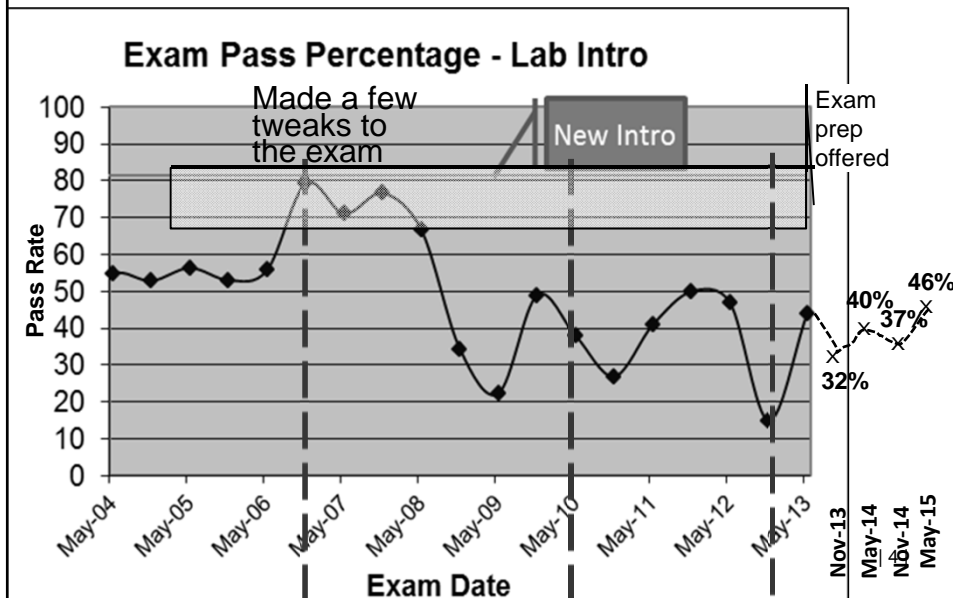
**NR 114.05 Examinations and applications.**

NR 114.05(1)(1) Examinations and on-the-job experience shall be used to determine knowledge, skill and ability of the applicant to perform duties at a waterworks. A score of 75% or higher shall be a passing score on each written examination.

- Old exam: 30 of 40 questions
- miss ≤ 10 questions
- NEW exam: 50 questions
- miss ≤ 12 questions

**38/50 = 76%**

### Historical exam performance





### **INTRO EXAM SINCE OUR TRAINING**

**May 2015 - Total pass rate 45.6%**

Pass rate excluding those that took our class 37.0%

**Pass rate of those that took our class 84.6%**

**Nov 2014 - Total pass rate 37%**

Pass rate excluding those that took our class 25.4%

**Pass rate of those that took our class 92%**

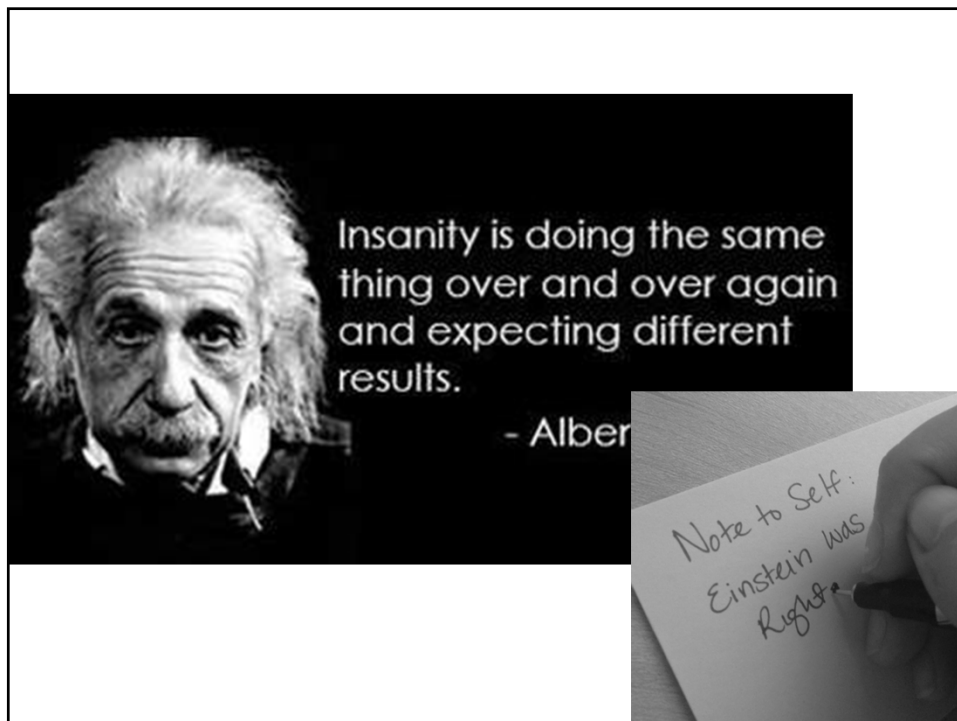
**May 2014 - Total pass rate 40%**

Pass rate excluding those that took our class 27.5%

**Pass rate of those that took our class 83%**

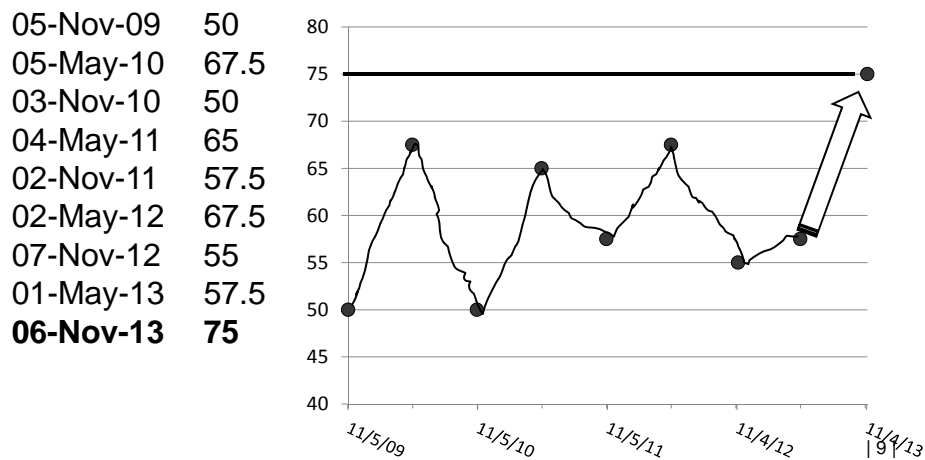
## WHY have people failed this exam?

- What's hard about it?
- Did you look at the Study Guide first?
- Did you take a prep class?
- If you took a class...do you think it helped?
- No different than corrective action in the lab
- Is it **you**, the **ammo**, or the **rifle**?
- Can we rule out things one at a time?
- But **if you repeat the same process, you should expect the same results.**
- If it's not you or the rifle...maybe switch ammo <sup>171</sup>



## Operator X

- What corrective action did Operator X take over 8 exam cycles for the Adv. Lab Exam?



## Post-Exam QA/QC

- We DO look at Exam results!
- A Quality Assurance review to ensure that the exam is properly measuring operator knowledge.
- Ask the questions:
  - Is the passing rate acceptable?
  - Particular question(s) too easy?
  - Particular question(s) too difficult?
  - Is there more than one perceived correct answer?
- Additionally, review operator comments/concerns about the exams

# Quintile review

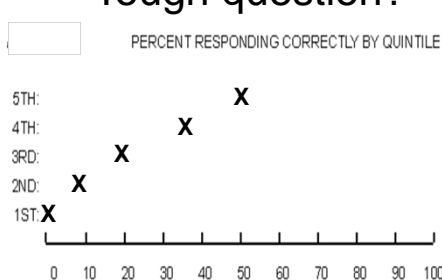
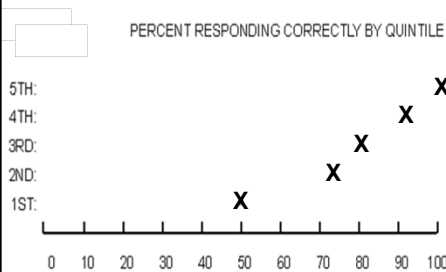
DEPARTMENT OF NATURAL RESOURCES  
 QUINTILE SCORE GROUPS  
 LAB ADV

Break down exams into 5 groups of ~ equal numbers based on score

QUINTILE	SAMPLE SIZE	PROPORTION	SCORE RANGE
5	10	0.19	77.50 - 95.00
4	11	0.21	72.50 - 77.50
3	10	0.19	65.00 - 72.50
2	11	0.21	57.50 - 65.00
1	10	0.19	42.50 - 57.50

Good question

Tough question?



# Bimodal population scan

Good question

Tough question?

MATRIX OF RESPONSES BY QUINT

	A	B	C	D
5TH:	0	10	0	0
4TH:	0	10	0	1
3RD:	1	8	1	0
2ND:	1	8	1	1
1ST:	0	5	4	1
PROP:	0.04	[0.79]	0.12	0.06
RPBI:	-0.06	[0.38]	-0.37	-0.11

MATRIX OF RESPONSES BY QUINT

	A	B	C	D
5TH:	0	5	4	1
4TH:	2	4	5	0
3RD:	1	2	5	2
2ND:	4	1	5	1
1ST:	1	0	7	2
ROP:	0.15	[0.23]	0.50	0.12
RPBI:	-0.19	[0.49]	-0.19	-0.14

Either chose A or B

Guessing?

MATRIX OF RESPONSES BY QUINT

	A	B	C	D
5TH:	8	2	0	0
4TH:	6	5	0	0
3RD:	6	4	0	0
2ND:	5	6	0	0
1ST:	5	5	0	0
PROP:	[0.58]	0.42	0.00	0.00
RPBI:	[0.21]	-0.21	0.00	0.00

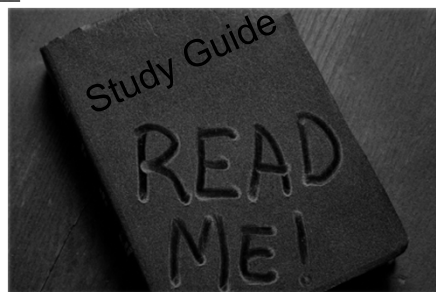
MATRIX OF RESPONSES BY QUINT

	A	B	C	D
5TH:	2	0	3	5
4TH:	1	2	5	3
3RD:	2	1	6	1
2ND:	3	1	6	1
1ST:	5	1	3	1
PROP:	0.25	0.10	0.44	[0.21]
RPBI:	-0.21	-0.05	-0.06	[0.34]

## READ the Study Guides!



← 2 EXTREMES →



- READ the Study Guides.
- ...and ...**don't be like Sherby!**

## DON'T BE A SHERBY!

- Kaffee: You gotta trust me, Sherby, you read the Study Guide and your chances of passing the exam increase by a factor of 10

## READ THE STUDY GUIDES!



# How to effectively study/prepare for an exam:

## Reading for Comprehension

### Reading for Comprehension

- Highlight important ideas.
- Circle or bracket **key terms**.
- Identify the **main point(s)** of the info.
- Can you eliminate ~~certain parts that just seem to be a lot of extra words like tangential observations that don't really add anything of particular note other than length to the information as "extraneous" information?~~
- Look for "telling" words: "always, must, require"
- Often the first sentence is VERY important!
- What question(s) would YOU create?





### **Reading for Comprehension isolating critical info**

5.1.04 Define super-saturation.

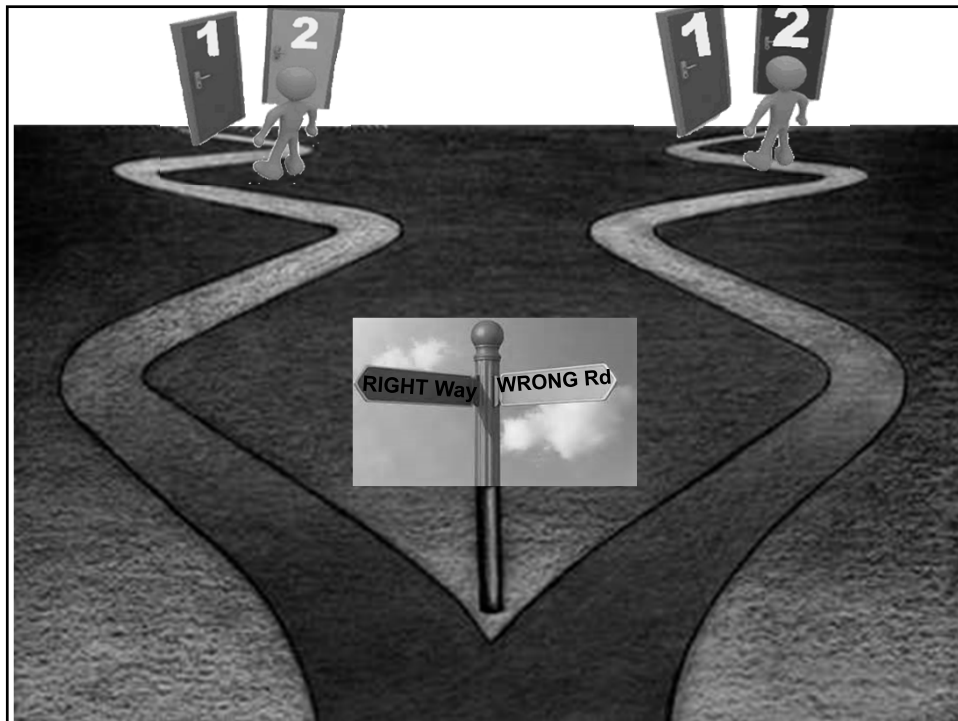
- Supersaturation **means** that the water contains more DO than it SHOULD contain according to physical tables.
- **According to tables, the** saturation point of oxygen in water at 20° and 760 mm pressure -which is standard temperature and pressure at sea level- is 9.06 mg/L. So, yes, at sea level and 20°C, anything over 9.06 mg/L represents supersaturation.
- The method kind of “defines” super-saturation as anything above 9.0 mg/L.

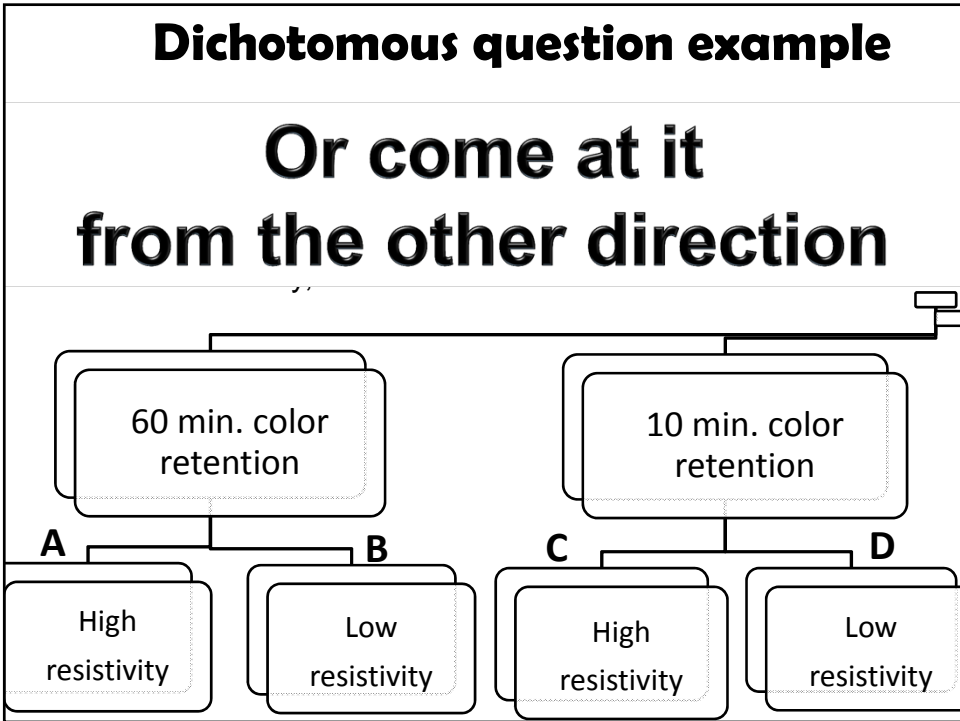
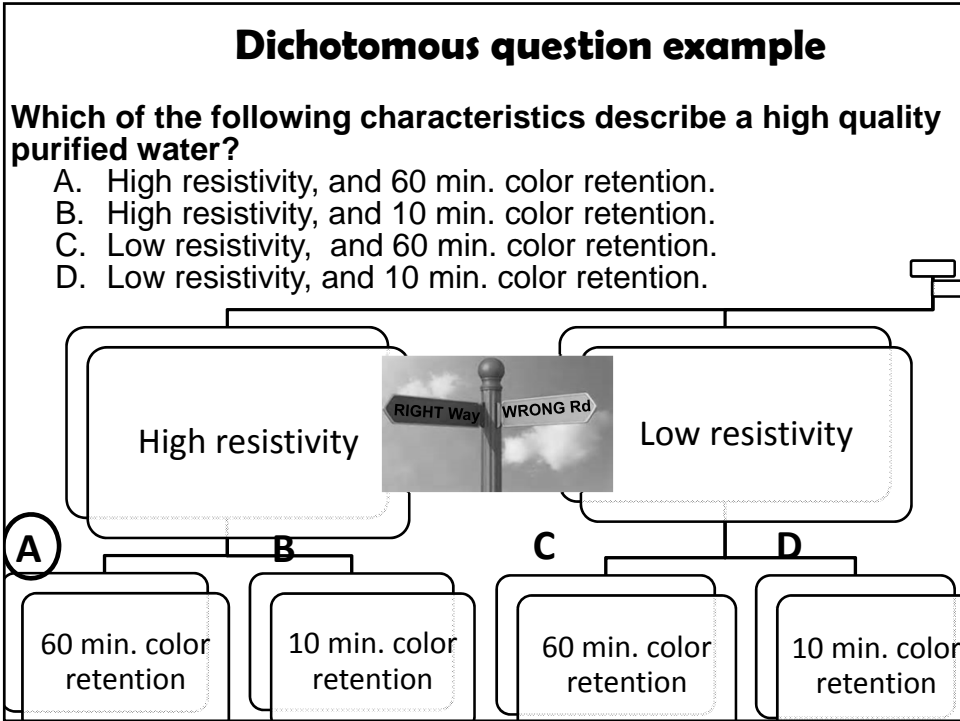
**However,** in reality saturation will vary with temperature and pressure. Consult a DO saturation table.

### **Multiple Choice Test Taking Tips**

- Read the question before you look at the answer.
- Come up with the answer in your head before looking at the possible answers, this way the choices given on the test won't throw you off or trick you.
- Eliminate answers you know aren't right.
- Read all the choices before choosing your answer.
- Don't keep on changing your answer; usually your first choice is the right one, unless you misread the question.

**Many multiple choice answers have a dichotomy, or branching, to them. It's almost like a fork in the road and at the end of each fork are two doors.**

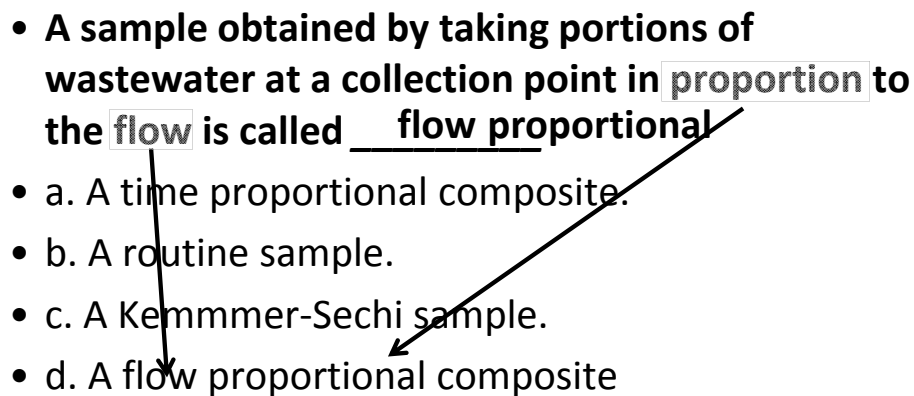




### Is the answer in the question?

- Sometimes the right answer can be found right in the question itself.
- If an exam is developed allowing trickery (*these tempting answers are called “distractors”, or “foils”*), this can be used to throw you off.
- But if trickery is not part of the design, use the words of the question to help find the right answer.

### Answer in Question example

- A sample obtained by taking portions of wastewater at a collection point in proportion to the flow is called flow proportional
  - a. A time proportional composite.
  - b. A routine sample.
  - c. A Kemmmer-Sechi sample.
  - d. A flow proportional composite
- 

## Let's look at some sample Lab related questions from other exam sources

### Calibration

When calibrating an instrument that uses a linear curve, what is the minimum number of concentrations that must be used?

- A. One
- B. Two
- C. Three
- D. Five

- Read carefully! Do not leap to conclusion or decide on the answer without reading the question fully.
- It says calibrate...not CHECK the calibration.
- MINIMUM...not how many standards YOU use in your lab.

**How do you preserve a sample for ammonia if it cannot be analyzed when collected ?**

Cool to  $\leq$  10°C

**1. Temperature**

**2. Acid? Or**

Cool to  $\leq$  6°C

Add NaOH to pH > 11 **A**

Add H2SO4 to pH < 2 **B**

Add NaOH to pH > 11 **C**

Add H2SO4 to pH < 2 **(D)**

**BASIC ?s**

**Agitating a sample before measuring DO for BOD ...**

- Decreases the DO.
- Increases the DO.
- Decreases the SS.
- Increases the SS.

**Dissolved Oxygen**

↙ ↘

**Increases it    Decreases it**

**TSS**

↙ ↘

**Increases it    Decreases it**

Example of a bad question...why?

**BASIC - BOD**

**The BOD of wastewater determines the milligrams per liter of oxygen required...**

- a. During stabilization of decomposable organic matter by aerobic bacterial action.
- b. To produce an equilibrium between the oxygen of the wastewater and atmospheric oxygen.
- c. To unite chemically with the inorganic matter present in the sample.
- d. For the oxidation of sulfites and thiosulfates to sulfates.

**Minimal rewording of answers**

**BASIC - BOD**

**The BOD of wastewater determines the milligrams per liter of oxygen required...**

- a. Bacterial action on organic matter
- b. Equalize wastewater Oxygen with air
- c. Bond with inorganic matter
- d. Oxidize sulfites and thiosulfates

**Minimal rewording of answers**

## BASIC - BOD

**BOD incubation is at:**

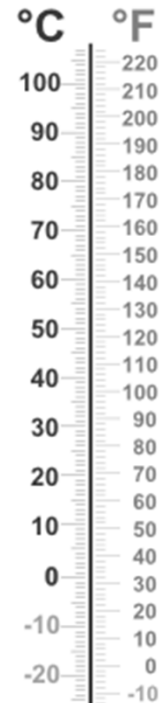
~~a. 37° C.~~

~~b. 98° F.~~

c. 20° F.

d. 20° C.

Incubate? or Hibernate?



- 37 °C equals about 98 °F...so since both can't be right, neither is!
- Where would you prefer to incubate? At 20 °F or 20 °C?

## You're guessing!

**The reporting limit for residual chlorine must not exceed:**

- A. 0.380 mg/L [21% chose this]
- B. 0.100 mg/L [26% chose this]
- C. 0.200 mg/L [18% chose this]
- D. 1.00 mg/L [35% chose this]

Retired INTRO question



## Creating Flashcards

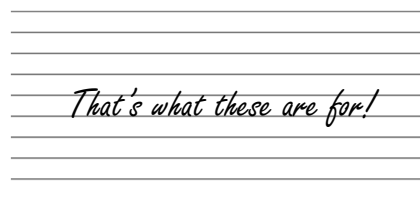
- Summarize the CRITICAL information from the study guide and copy to index cards.
- Use THESE to study

### Writing your own questions

- If you were quizzing someone on the topic, what questions would you ask?
- Writing the question and correct answer is the easy part.
- Coming up with 3 “wrong” answers without using all/none of the above and not being too tricky is a challenge!

## Creating Flashcards

- Summarize the CRITICAL information from the study guide and copy to index cards.
- Use THESE to study



Total suspended solids (TSS) are those which are visible and in suspension in the water.

They are the solids which can be removed from wastewater by physical or mechanical means such as sedimentation, flocculation, or filtration. TSS will include the larger floating particles and consist of silt, grit, clay, fecal solids, paper, fibers, particles of food, garbage, and similar materials. Suspended solids are approximately 70% organic and 30% inorganic. TSS determinations may be used to assess wastewater strength, process efficiency, and loadings.

By reducing the TSS in your effluent discharge, you are going to get better disinfection, which will reduce your fecal coliform and/or E. coli counts, allowing you to maintain compliance.

The organic fraction of suspended solids is comprised generally of animal or vegetable matter, but may also include synthetic organic compounds. Organic compounds are substances which contain carbon, hydrogen, and oxygen, some of which may be combined with nitrogen, sulfur, and phosphorus. The principle organic compounds found in wastewater are proteins, carbohydrates, and fats, together with their products of decomposition. In general, they are combustible.

### Discuss the importance of TSS in wastewater analyses.

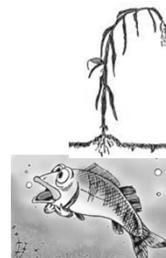
The inorganic fraction of suspended solids is inert and typically not subject to decay. Exceptions to this characteristic are certain mineral salts, such as sulfates, which, under certain conditions, can be broken down. Inorganic solids are frequently called mineral substances and include sand, gravel, and silt, as well as the mineral salts in the water supply which produce the hardness and mineral content of the water. In general, they are not combustible.

High TSS can block light from reaching aquatic vegetation. Photosynthesis is inhibited as the amount of light passing through the water is cut down. Without photosynthesis, aquatic plants produce less oxygen, which is a significant source of DO. If light is completely blocked from bottom dwelling plants, the plants will stop producing oxygen and will die. As the plants are decomposed, bacteria will consume what oxygen (DO) is present in the water. Low DO is a major contributor to fish kills.

High concentrations of TSS can also result in an increase in surface water temperature, because the suspended particles absorb heat from sunlight. Higher temperatures consequently result in a reduced ability of the water to hold DO.

## Flash Card: TSS and wastewater

- High TSS interferes with disinfection efficiency
- High TSS reduces light for aquatic plants
  - Without light, plants die
  - Plants provide oxygen, so less plants = less DO
  - Dying plants suck up available DO (demand)
  - Low oxygen results in fish kills
  - Fish kills only ADD to the BOD (and TSS)
- High TSS raises surface water temp. (particles absorb sunlight)...which also lowers DO



## TSS



**Organic**  
**70%**

**Inorganic**  
**30%**



## What questions would YOU write for this?



### 1.1.3 Proper preparation of dilute acid solutions from concentrated acids.

- Always pour acid into water (NOT vice versa) and swirl or mix to dissipate the heat of the reaction. This activity should be performed in a fume hood or in a well-ventilated area.
- When acid is poured directly into water, an exothermic (heat generating) reaction results and can cause splash-back of acid onto the analyst.
- "Do what you otter...add acid to water"

**How about these....**

- To properly prepare dilute acid solutions from concentrated acids:  
Pour acid into water.
- When acid is poured directly into water, an \_\_\_\_\_ reaction results  
exothermic