CT4471-OCW DRINKING WATER TREATMENT 1 (2006-2007) (4383-2006OCW) > CONTROL PANEL > TEST MANAGER > TEST CANVAS

Test Canvas

Add, modify, and remove questions. Select a question type from the Add Question drop-down list and click **Go** to add questions. Use Creation Settings to establish which default options, such as feedback and images, are available for question creation.

Add Calculated Formula GO | Creation Settings

Name Aeration version 2

Description Questions related to Aeration and Gas Transfer of CT4471 Drinking Water Treatment 1.

Instructions Answer the questions in small groups (2 persons). Think well before answering and consult your lecture notes or other sources if necessary. The test can only be made once.

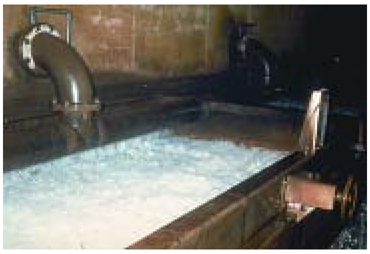
Modify

Add Question Here

Question 1 **Matching** **10 points** Modify Remove

Question Which gas transfer system maches with the given photographs?

Answer

Match Question Items	Answer Items
B. - A. 	A. Spray aeration
D. - B. 	B. Cascade aeration
A. - C. 	C. Tower aeration
C. - D. 	D. Plate aeration

Correct Feedback Section 2.1

Incorrect Feedback Section 2.1

Add Question Here

Question 2 **Matching** **10 points** Modify Remove

Question Which words belong to which aeration system?

Answer

Match Question Items		Answer Items
D. -	A. Cascade aeration.	A. orifices.
B. -	B. Tower aeration.	B. packing media.
A. -	C. Plate aeration.	C. droplets.
C. -	D. Spray aeration.	D. weirs.

Correct Feedback Section 2.1
Incorrect Feedback Section 2.1

Add Question Here

Question 3 **Multiple Choice** **10 points** Modify Remove

Question

Nett gass transport takes place from water to air until the gas concentration in water is equal to

Answer

RQ
✓ saturation concentration.
zero
gas concentration in air.

Correct Feedback See section 2.2.1
Incorrect Feedback See section 2.2.1

Add Question Here

Question 4 **True/False** **10 points** Modify Remove

Question

The saturation concentration is calculated with the next formula:

kD is smaller at a higher temperature

$$c_s = k_D \cdot c_l$$

Answer

✓ True
False

Correct Feedback See section 2.2.1, table 2.1
Incorrect Feedback See section 2.2.1, table 2.1

Add Question Here

Question 5 **True/False** **10 points** Modify Remove

Question Gasses with a low k_D-values hardly dissolve in water and are therefore difficult to remove from the water.

Answer

True
✓ False

Correct Feedback See section 2.2.1
Incorrect Feedback See section 2.2.1

Add Question Here

Question 6 **Multiple Choice** **10 points** Modify Remove

Question With an increasing water temperature the saturation concentration ....

Answer

✓ Decreases
increases
remains the same

Correct Feedback Figure 2.6
Incorrect Feedback Figure 2.6

Add Question Here

Question 7 **Multiple Answer** **10 points** Modify Remove

Question Which equation need to be used if the variation of the gas concentration in air cannot be neglected?

Answer

equilibrium equation
kinetic equation
✓ mass balance

Correct Feedback See section 2.2.4
Incorrect Feedback See section 2.2.4

Add Question Here

Question 8 **Multiple Choice** **10 points** Modify Remove

Question

Fill in the blanks:

k_2 is the gas transfer coefficient. The larger the contact surface area between air and water and the renewal of this surface area the ...... the gas transfer and the .... the gas transfer coefficient.

Answer

worse, higher

worse, smaller
✓ better, higher
better, smaller

Correct Feedback See section 2.2.2
Incorrect Feedback See section 2.2.2

Add Question Here

Question 9 **Matching** **10 points** Modify Remove

Question K is the efficiency of a gas transfer system. Which formula belongs to which basic system?

Answer

Match Question Items	**Answer Items**
C. - A.	A.

$$K_1 = 1 - \exp(-k_2 \cdot t)$$	Plug flow, co-current flow and variable gas concentration in air.
E. - B. $$K_2 = \frac{1}{1 + \frac{1}{k_2 \cdot t}}$$	B. Complete mixed system with variable gas concentration in air.
A. - C. $$K_3 = \frac{1 - \exp\left(-k_2 \cdot t \cdot \left(1 + \frac{k_D}{RQ}\right)\right)}{1 + \frac{k_D}{RQ}}$$	C. Plug flow with constant gas concentration in air.
D. - D. $$K_4 = \frac{1 - \exp\left(-k_2 \cdot t \cdot \left(1 - \frac{k_D}{RQ}\right)\right)}{1 - \frac{k_D}{RQ} \cdot \exp\left(-k_2 \cdot t \cdot \left(1 - \frac{k_D}{RQ}\right)\right)}$$	D. Plug flow, counter current flow and variable gas concentration in air.
B. - E. $$K_5 = \frac{1}{1 + \frac{1}{k_2 \cdot t} + \frac{k_D}{RQ}}$$	E. Complete mixed system with constant gas concentration in air.

Correct Feedback See section 2.2.4

Incorrect Feedback See section 2.2.4

Add Question Here

Question 10 **True/False** **10 points** Modify Remove

Question The removal of carbondioxide by one cascade is independent on fall height.

Answer
✓ True
False

Correct Feedback From the lecture notes it can be concluded that for carbondioxide, the removal efficiency of one cascade is approximately 0.15 and is independent of fall height.

Incorrect Feedback From the lecture notes it can be concluded that for carbondioxide, the removal efficiency of one cascade is approximately 0.15 and is independent of fall height.

Add Question Here

Question 11 **Multiple Choice** **10 points** Modify Remove

Question
The composition of air is given in table. For the removal of methane from groundwater a water company uses cascade aeration. The aeration consists of 5 stages and the total falling height is 2 m. The concentration of methane in the raw water is 0,8 mg/l and after the first stage 0,54 mg/l.

Table ¿ composition of air (10°C, 101325 Pa).

Gas	Volume percentage [%]
N_2	78,084
O_2	20,948
Ar	

CO_2	0,934
CH_4	0,034
	0,00001

Calculate the equilibrium concentration of methane in water at a pressure of 101325 Pa and a temperature of 10°C.

Answer

- 2.96*10-4 mg/l
- 8.38*10-5 mg/l
- ✓ 2.96*10-6 mg/l
- 2.34*10-6 mg/l

Correct Feedback

k_D voor methaan bij 10°C → k_D = 0.043
P = 0.00001/100·101325 = 0.01013 Pa
$c_g = 0.01013 \cdot 16/(8.31 \cdot 283) = 6.9 \cdot 10^{-5}$
$c_s = 0.043 \cdot 6.9 \cdot 10^{-5} = 2.96 \cdot 10^{-6}$ mg/l

$$c_s = k_D \cdot c_g; \quad c_g = \frac{P \cdot MW}{R \cdot T}$$

Incorrect Feedback

k_D voor methaan bij 10°C → k_D = 0.043
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$c_s = 0.043 \cdot 6.9 \cdot 10^{-5} = 2.96 \cdot 10^{-6}$ mg/l

$$c_s = k_D \cdot c_g; \quad c_g = \frac{P \cdot MW}{R \cdot T}$$

Add Question Here

Question 12 **Multiple Choice** **10 points** Modify Remove

Question
For the removal of methane from groundwater a water company uses cascade aeration. The aeration consists of 5 stages and the total falling height is 2 m. The concentration of methane in the raw water is 0,8 mg/l and after the first stage 0,54 mg/l.

Calculate the methane removal after 5 cascade stages.

Answer

- ✓ 0.86
- 0.33
- 0.39
- 0.96

Correct Feedback

First calculate the efficiency for one stage, use this answer to calculate the efficiency for five stages.

$$k = \frac{c_e - c_0}{c_s - c_0} = \frac{0.54 - 0.80}{0 - 0.80} = 0.33$$

$$K = 1 - (1-k)^n = 1 - (1 - 0{,}33)^5 = 0.87$$

Incorrect Feedback

First calculate the efficiency for one stage, use this answer to calculate the efficiency for five stages.

$$k = \frac{c_e - c_o}{c_s - c_o} = \frac{0.54 - 0.80}{0 - 0.80} = 0.33$$

$$K = 1 - (1-k)^n = 1 - (1 - 0{,}33)^5 = 0.87$$

Add Question Here

Question 13 **Multiple Choice** **10 points** Modify Remove

Question

Assuming K= 0.33 and Kd is 0.034, calculate the value of k_2*t for only one cascade stage with the assumption that the RQ of a cascade stage is 0.4.

Answer

- ✓ 0.49
- 0.40
- 0.41
- 0.52

Correct Feedback The formula for complete mixed systems with variable gas concentration need to be used.

$$K = \frac{1}{1 + \frac{1}{k_2 \cdot t} + \frac{k_D}{RQ}} \Rightarrow 0{,}33 = \frac{1}{1 + \frac{1}{k_2 \cdot t} + \frac{0.043}{0.4}} \Rightarrow k_2 \cdot t = 0.52$$

Incorrect Feedback The formula for complete mixed systems with variable gas concentration need to be used.

$$K = \frac{1}{1 + \frac{1}{k_2 \cdot t} + \frac{k_D}{RQ}} \Rightarrow 0{,}33 = \frac{1}{1 + \frac{1}{k_2 \cdot t} + \frac{0.043}{0.4}} \Rightarrow k_2 \cdot t = 0.52$$

Add Question Here

Question 14 **Matching** **10 points** Modify Remove

Question In groundwater treatment aeration and gas transfer is needed to remove methane, carbon dioxide and hydrogen sulfide. Why need these gasses to be removed? Match the right explanation with the gasses.

Answer

Match Question Items	Answer Items
B. - A. Methane	A. to avoid excessive dosing of chemicals during softening.
A. - B. Carbon dioxide	B. To prevent biological growth in filters.
C. - C. Hydrogen sulfide	C. For taste and odour.

Correct Feedback See section 2.1.

Incorrect Feedback See section 2.1.

Add Question Here

Question 15 **Multiple Choice** **10 points** Modify Remove

Question A cascade stage with a height of 30 cm has a gas removal efficiency of 15%. How many steps are necessary to remove at least 60%?

Answer

- 4
- 5
- ✓ 6

Correct Feedback

Incorrect Feedback

$K=1-(1-k)^n$. K=0,6; k=0,15 => n=6.

$K=1-(1-k)^n$. K=0,6; k=0,15 => n=6.

Add Question Here

Question 16 **Multiple Choice** **10 points** Modify Remove

Question What is approximately the RQ of a cascade?

Answer

- ✓ 0.4
- 11
- 90

Correct Feedback See page 8.

Incorrect Feedback See page 8.

Add Question Here

Question 17 **Multiple Answer** **10 points** Modify Remove

Question

For which gasses is the cascade suitable? More answers can be right.

Answer

- Removal of chloroform.
- ✓ Addition of oxygen.
- ✓
- Removal of carbon dioxide.
- ✓ Removal of methane.

Correct Feedback See page 8.

Incorrect Feedback See page 8.

Add Question Here

Question 18 **True/False** **10 points** Modify Remove

Question The application of a tower aerator can lead to precipitation of calcium carbonate.

Answer

- ✓ True
- False

Correct Feedback Because carbon dioxide is stripped from the water, the water obtains a calcium carbonate precipitating potential.

Incorrect Feedback Because carbon dioxide is stripped from the water, the water obtains a calcium carbonate precipitating potential.

Add Question Here

Question 19 **True/False** **10 points** Modify Remove

Question The retention time in a tower aerator is practically independent of the water flow.

Answer

- ✓ True
- False

Correct Feedback See page 12.

Incorrect Feedback See page 12.

Add Question Here

Question 20 **Multiple Choice** **10 points** Modify Remove

Question Is it necessary to back flush a tower aerator?

Answer

Yes, this is necessary.

✓ No, this is not necessary.

This is only necessary if iron is present in groundwater.

Correct Feedback See page 12.

Incorrect Feedback See page 12.

Add Question Here

OK