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 Coagulation and floc formation
Description Questions about Coagulation and Floc formation of CT4471 Drinking Water treatment 1
Instructions Answer the questions in small groups (2 persons). Think well about the answers and you are allowed to consult your lecture notes and other sources

Modify

Add Question Here

Question 1 **True/False** **10 points** Modify Remove

Question The traditional treatment of surface water consisted of coagulant dosing, followed by floc formation-settling and rapid filtration.

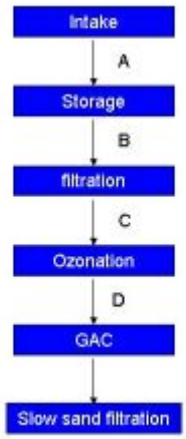
Answer
True
✓ False

Correct Feedback After filtration disinfection by chlorine was applied.
Incorrect Feedback After filtration disinfection by chlorine was applied.

Add Question Here

Question 2 **Multiple Answer** **10 points** Modify Remove

Question Indicate possible locations of coagulation in the treatment train (more answers can be possible).



Answer
✓ A
✓ B
C
D

Correct Feedback Coagulation before the reservoir can be used for nutrient removal (to avoid algae blooms). Coagulation after the reservoir is used for turbidity (and organic matter) removal.
Incorrect Feedback Coagulation before the reservoir can be used for nutrient removal (to avoid algae blooms). Coagulation after the reservoir is used for turbidity (and organic matter) removal.

Add Question Here

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

Question

Which of the following chemicals are used as coagulants?

(More answers can be correct)

Answer

✓ $Fe_2(SO_4)_3$

✓ $FeCl_3$

$Ca(OH)_2$

$NaOH$

$KMnO_4$

✓ $Al_2(SO_4)_3$

Correct Feedback Only trivalent ions are used for coagulation (iron and aluminium).

NaOH and $Ca(OH)_2$ are used for softening and $KMnO_4$ is used for oxidation.

Incorrect Feedback Only trivalent ions are used for coagulation (iron and aluminium).

NaOH and $Ca(OH)_2$ are used for softening and $KMnO_4$ is used for oxidation.

Add Question Here

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

Question

Jar tests are executed to determine optimal coagulant dose, pH and coagulant aid cose.

Answer

✓ True

False

Correct Feedback No comments

Incorrect Feedback No comments

Add Question Here

Question 5 **Matching** **10 points** Modify Remove

Question Match the coagulation mechanisms

Answer

Match	Question Items	Answer Items
B. -	A. Attachment to positive hydrolysis products	A. Sweep coagulation
A. -	B. Incorporation in hydroxide flocs	B. Adsoptive coagulation
C. -	C. Positive ions destabilise colloids	C. Electrostatic coagulation

Correct Feedback No comments

Incorrect Feedback No comments

Add Question Here

Question 6 **Matching** **10 points** Modify Remove

Question Match coagulation mechanisms

Answer

Match	Question Items	Answer Items
B. -	A. Low pH	A. Sweep coagulation
C. -	B. High turbidity	B. Adsorptive coagulation
A. -	C. Low turbidity	C. Electrostatic coagulation

Correct Feedback No comments

Incorrect Feedback No comments

Add Question Here

Question 7 **Matching** **10 points** Modify Remove

Question

The following three water types are coagulated with Ferric Chloride

	Watertype A	Watertype B	Watertype C
Suspended solids	very high	low	low
Color	low	high	low
pH	8	6,5	8

Which coagulation mechanisms are involved during the coagulation of the different water types?

Answer

Match	Question Items	Answer Items
C. -	A. Water type A	A. Electrostatic coagulation
B. -	B. Water type B	B. Adsorptive coagulation
C. -	C. Water type C	C. Sweep coagulation

Correct Feedback Water type A: destabilisation coagulation because of the high suspended solids, not much iron necesasary.
Water type B: adsorptive coagulation remove a part of the color at low pH. High dose of iron needed
Water type C: sweep coagulation high dose needed. Coagulation is also used to remove pathogens.

Incorrect Feedback Water type A: destabilisation coagulation because of the high suspended solids, not much iron necesasary.
Water type B: adsorptive coagulation remove a part of the color at low pH. High dose of iron needed

Water type C: sweep coagulation high dose needed. Coagulation is also used to remove pathogens.

Add Question Here

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

Question The term "Enhanced Coagulation" is used when the purpose is to remove

Answer
- Turbidity
- ✓ Organic matter
- Pathogenic micro-organisms
- Organic micro-pollutants

Correct Feedback During enhanced coagulation the coagulant dose is increased and the pH is lowered. Then the adsorptive coagulation mechanism prevails and organic matter is incorporated in the flocs.

Incorrect Feedback During enhanced coagulation the coagulant dose is increased and the pH is lowered. Then the adsorptive coagulation mechanism prevails and organic matter is incorporated in the flocs.

Add Question Here

Question 9 **True/False** **10 points** Modify Remove

Question At lower temperatures coagulation can be enhanced by using higher coagulant doses, increase impeller speed and/or applying coagulant aids.

Answer
- ✓ True
- False

Correct Feedback At lower temperatures, the viscosity increases and thus G-value decreases. Therefore, impeller speed have to be increased. Setlling of flocs will be more difficult, thus larger and heavier flocs have to be produced. Coagulant aids and increased coagulant dose will therefore be applied.

Incorrect Feedback At lower temperatures, the viscosity increases and thus G-value decreases. Therefore, impeller speed have to be increased. Setlling of flocs will be more difficult, thus larger and heavier flocs have to be produced. Coagulant aids and increased coagulant dose will therefore be applied.

Add Question Here

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

Question

With a velocity of 750 m^3/h the water is fed to two units. The coagulant is added in a cascade with a height of 0,2 m. The shear of mixing (G_c) at a temperature of 10 °C is for this situation 1500 s^{-1}.

The coagulation compartment is a bit over dimensioned and therefore, if the velocity is below 500 m^3/h, only one unit is used. What is the shear at a velocity of 500 m^3/h and a temperature of 10°C (one unit in use).

Answer
- 1430
- 1530
- 1630
- ✓ 1730

Correct Feedback At the design flow all the water flows over 2 units: 750/2 = 375 m^3/h per unit. The G-value for rapid mixing is 1500 s^{-1} = $((\rho*g*\Delta h)/(\mu*\tau))^{1/2}$, resulting in a contact time of 0.67 secondes.

When 500 m^3/h instead of 375 m^3/h flows through 1 unit the contact time will be: 375/500·0.67 = 0.50 secondes. The G-value (shear) will be 1730 s^{-1}.

Incorrect Feedback At the design flow all the water flows over 2 units: 750/2 = 375 m^3/h per unit. The G-value for rapid mixing is 1500 s^{-1} = $((\rho*g*\Delta h)/(\mu*\tau))^{1/2}$, resulting in a

contact time of 0.67 secondes.

When 500 m^3/h instead of 375 m^3/h flows through 1 unit the contact time will be: 375/500·0.67 = 0.50 secondes. The G-value (shear) will be 1730 s^{-1}.

Add Question Here

Question 11 **True/False** **10 points** Modify Remove

Question In floc formation orthokinetics is the predominant mechanism.

Answer
✓ True
False

Correct Feedback During peri-kinetic floc formation particles collide as a result of Brownian motion. During ortho-kinetic floc formation the collision frequency is artificially increased. Because of the size of the flocs the latter is the predominant mechanism.

Incorrect Feedback During peri-kinetic floc formation particles collide as a result of Brownian motion. During ortho-kinetic floc formation the collision frequency is artificially increased. Because of the size of the flocs the latter is the predominant mechanism.

Add Question Here

Question 12 **True/False** **10 points** Modify Remove

Question When the temperature drops from 20 ^0C to 10 ^0C, the dissipated power of a stirring device should decrease with a factor 1.14 to obtain equal G-values.

Answer
True
✓ False

Correct Feedback When the temperature drops from 20 ^0C to 10 ^0C, the dissipated power of a stirring device should increase with a factor 1.14 to obtain equal G-values.

Incorrect Feedback When the temperature drops from 20 ^0C to 10 ^0C, the dissipated power of a stirring device should increase with a factor 1.14 to obtain equal G-values.

Add Question Here

Question 13 **True/False** **10 points** Modify Remove

Question In the production location of Berenplaat (watercompany Evides), 80 sludge blancket clarifiers (5.7x8.3x3 m) are used for a combined coagulation/flocculation/sedimentation. About 2/3 of the sludge blanket clarifier is stirred mechanically (40 W per basin). The water production is 22000 m^3/h. The G_v-value in the flocculation part of the sludge blanket clarifier is equal to 20 s^{-1}.

Answer ✓ True

False

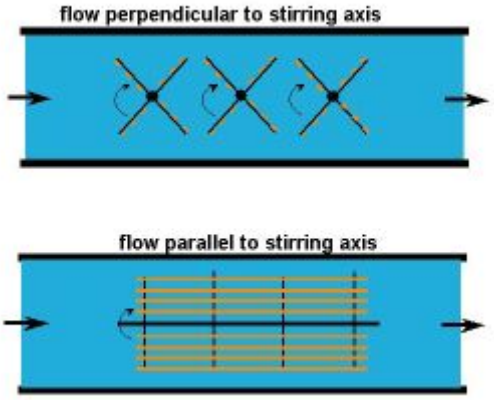
Correct Feedback $Gv= (P/(V*\mu))^{1/2}= (40/(94.6/1000))^{1/2}= 20\ s^{-1}$

Incorrect Feedback $Gv= (P/(V*\mu))^{1/2}= (40/(94.6/1000))^{1/2}= 20\ s^{-1}$

Add Question Here

Question 14 **True/False** **10 points** Modify Remove

Question When in a flocculation chamber the flow is perpendicular to the stirring axis less short circuiting occurs than in a chamber where the flow is parallel to the stirring axis (see figure).



Answer

True

✓ False

Correct Feedback In a flocculation chamber where flow is perpendicular to the stirring axis more short circuiting occurs than in a chamber where the flow is parallel to the stirring axis.

Incorrect Feedback In a flocculation chamber where flow is perpendicular to the stirring axis more short circuiting occurs than in a chamber where the flow is parallel to the stirring axis.

Add Question Here

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

Question Assuming a G-value of 50 s^{-1}, a contact time of 10 minutes and the factor $k_a.c_v=0.0001$, what are the concentrations of primary particles in the effluent of a plug flow and a completely stirred flocculation chamber respectively?

Answer

✓ 0.05 n_0 for plug flow and 0.25 n_0 for completely stirred tank reactor

0.05 n_0 for plug flow and 0.15 n_0 for completely stirred tank reactor

0.10 n_0 for plug flow and 0.25 n_0 for completely stirred tank reactor

0.10 n_0 for plug flow and 0.15 n_0 for completely stirred tank reactor

Correct Feedback

plug flow:

$n = n_0.e^{-k_a c_v Gt} = n_0.e^{-0.0001*50*10*60} = 0.05\ n_0$

completely stirred:

$n = 1/(1+ k_a c_v Gt) = 1/(1+0.0001*50*10*60) = 0.25\ n_0$

Incorrect Feedback

plug flow:

$n = n_0.e^{-k_a c_v Gt} = n_0.e^{-0.0001*50*10*60} = 0.05\ n_0$

completely stirred:
$n = 1/(1+ k_a c_v Gt) = 1/(1+0.0001*50*10*60) = 0.25\ n_0$

Add Question Here

Question 16 **True/False** **10 points** Modify Remove

Question During floc formation the maximum rotation speed of an impeller with a radius of 1.8 m is 5.3 rotations per minute.

Answer
✓ True
False

Correct Feedback Vtip = 2*pi*r*N = 1 m/s => N=1/(2*pi*1.8)*60=5.3 rotations per minute

Incorrect Feedback Vtip = 2*pi*r*N = 1 m/s => N=1/(2*pi*1.8)*60=5.3 rotations per minute

Add Question Here

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

Question The picture shows the following device:

Answer

Rapid mixer
Mechanical mixer
✓ Hydraulic mixer
Flocculent settler

Correct Feedback The picture shows a hydraulic mixer that is frequently applied in developing countries, because of its robustness and low energy consumption.

Incorrect Feedback The picture shows a hydraulic mixer that is frequently applied in developing countries, because of its robustness and low energy consumption.

Add Question Here

OK