TEST – RO system design & troubleshooting



Name : _____ Company : _____

1. When determining the flux of waste water which SDI is 5, how much flux is determined generally?

13-17 gfd ② 16-20gfd ③ 8-12 gfd ④ 7-10 gfd

- 2. For stable RO operation, it is important to check RO feed water quality carefully as guideline of RO feed water. What is the maximum level of TOC?
 - □ 10 ppm ② 3ppm ③ 5 ppm ④ 0.05 ppm

3. What test is to confirm qualitatively whether the PA polymer structure was attacked by oxidative halogen chemicals like chlorine, bromine and iodine or not?

- □ Fujiwara Test ② Integrity test ③ Dye test ④ Performance test
- 4. If a membrane is fouled with organic compounds, what is the correct CIP method in the following?
 - Chemical : alkali, Temp. : $35 \sim 40^{\circ}$ C, pH 1-2
 - □ Chemical : surfactant, Temp. : 35~40°C, pH 11-12
 - Chemical : acid, Temp. : $35 \sim 40^{\circ}$ C, pH 1-2
 - Chemical : surfactant, Temp. : $15 \sim 20^{\circ}$ C, pH 1-2
- 5. If you want to produce 18m3/hr by RO membrane and know that flux is 12gfd. How many membranes are required? (m3/hr x 264.2 = gpd)
 - □ 25EA ② 30EA ③ 18EA ④ 24EA

6. For estimating the performance change by physical damages , vacuum test would be performed. what is the correct acceptable criteria in the following?

□ <120 mbar/min ② <130 mbar/min ③ <100 mbar/min ④ 150 mbar/min

7. To determine the causes and the location of a salt passage, the element is operated with a pressurized a colored solution prior to an autopsy. A color permeate would indicate membrane damage. What is called this test?

□ Fujiwara Test ② Integrity test ③ Dye test ④ Performance test

- 8. As a result of analyzing operating data, it shows that both permeate flow and salt passage increase but DP is stable. What cause is suspected in the following?
 - □ Scale ② Oxidation ③ Organic fouling ④ Detective products

9. This is a index of the scaling or corrosive potential of low TDS brackish water based on the level of saturation of calcium carbonate. Normally, with antiscalant, +1.5 is permitted for stable RO operation What is this?

SDSI 2 LSI 3 MFI 4 SDI

10. This is a option in CSMPRO. By this option, you can send the low TDS front permeate to final permeate. It would be used in 2nd pass RO for seawater desalination. What is this?

- Hybrid ② permeate blending ③ Split option ④ Concentrate recycle
- 11. The following image is a crystal of CaCO3 scale. What equipment should be used for the image?



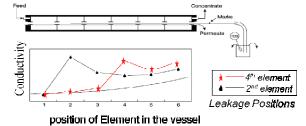
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① TEM ② TGA ③ SEM ④ Optical microscope

12. This is one of troubleshooting action. If one pressure vessel shows a significantly higher permeate concentration than the other vessels of the same stage, conductivity of every elements need to be checked. What is called?



□ Probing ② Profiling ③ Performance test ④ Dye test

13. In the followings, What is NOT suitable?

- \Box For the sea water feed, recovery is 45%
- \Box For the waste water feed, recovery is 70%
- \Box For the RO permeate feed, recovery is 30%
- \Box For the sea water feed, recovery is 50%

14. What is the spelling of "CIP"? (

)

15. In the followings, which case is usually adopted double pass system?

- □ For the sea water desalination
- □ For the waste water treatment
- □ For the UF permeate treatment
- □ For the brackish water treatment
- 16. Please write the appropriate numbers in the blanks.

Elements should be cleaned immediately when one of the following symptoms is detected.

- ✓ Normalized water flow has decreased by (\sim %) from start-up conditions.
- \checkmark Delta P, or pressure drop over a stage or the system, has increased by (\sim
- ✓ Salt rejection has decreased (ie permeate TDS has increased) significantly over time.

17~18. Please write the appropriate numbers in the blanks.

Scale or foulant	Normal	Maximum Reported	CSM alarm
Calcium Sulfate	230%	400%	17. ()%
Strontium Sulfate	800%	1,200%	800%
Barium Sulfate	6,000%	8,000%	6,000%
Silica	100%	130%	18. ()%

19~20. Calculate required pressure vessels (6elements/PV) and suitable array with the following information..

- Feed source : waste water < SDI 3</p>
- Single pass system
- Total Permeate flowrate : 10886.4m3/day
- Recovery : 75%
- Flux : 10 gfd (Membrane effective area 400ft2)

19. The number of required pressure vessels : vessels 20. Array :

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%).

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Answers

1	2	3	4	5	6	7	8	9	10
3	2	1	2	4	3	3	2	2	3
11	12	13	14	15	16	17	18	19	20
3	1	3	Clean In Place	1	10, 15, 10, 15	230	100	120	80:40