Continuing Education Course #053
Introduction to Reverse Osmosis Desalination

1. What is the capacity of the largest operational seawater desalination plant in the US?
   - a. 20 MGD
   - b. 50 MGD
   - c. 25 MGD
   - d. 10 MGD

2. What is the TDS concentration range of brackish seawater?
   - a. 500 mg/L to 15,000 mg/L
   - b. 200 mg/L to 10,000 mg/L
   - c. 1,000 mg/L to 25,000 mg/L
   - d. Higher than 15,000 mg/L

3. Reverse Osmosis Membranes Can Remove Viruses – True or False?
   - a. True
   - b. False

4. What Size Compounds Can Be Removed By RO Membranes?
   - a. 50 Daltons of less
   - b. 600 Daltons or more
   - c. 200 Daltons or more
   - d. 100 Daltons or less

5. Reverse Osmosis Membranes Cannot Remove Protozoa – True or False?
   - a. True
   - b. False

6. Water Sample Contains 601.2 mg/L of Calcium. What is the Concentration of Calcium in meq/L?
   - a. 45 meq Ca/L
   - b. 60 meq Ca/L
   - c. 22 meq Ca/L
   - d. 30 meq Ca/L

7. Which Compound Contributes Highest Percentage of the TDS Concentration of Ocean Water?
   - a. Sodium Sulfate
   - b. Calcium Chloride
   - c. Sodium Chloride
   - d. Magnesium Bicarbonate

8. Which Geographic Location Has Highest Ocean Water Salinity?
9. What is the Typical Ratio between TDS concentration in mg/L and EC in µS/m in Saline Source Waters?
   a. 0.67 to 0.70
   b. 0.55 to 0.95
   c. 0.70 to 0.85
   d. 0.35 to 0.60

10. Osmotic Pressure is a Function of the Type of RO Membrane Used for Desalination – True or False?
    a. True
    b. False

11. What is Osmotic Pressure of Source Water That Has TDS Concentration of 550 mg/L?
    a. 6.8 psi
    b. 68 psi
    c. 5.5 psi
    d. 340 psi

12. What is the Typical Recovery of Brackish Water RO System?
    a. 75% to 85%
    b. 40% to 55%
    c. 85% to 99%
    d. 30% to 45%

13. Below What Concentration Can RO Membranes Remove Iron in Oxidized Form without Fouling?
    a. less than 2 mg/L
    b. less than 0.1 mg/L
    c. more than 2.5 mg/L
    d. less than 0.05 mg/L

14. Semi-permeable RO Membranes Let Dissolved Solids Pass Through at Higher Rate than They Do Water – True or False?
    a. True
    b. False

15. Permeate Recovery Rate is a Ratio between Which Two Parameters?
    a. Permeate and Concentrate Flows
    b. Concentrate and Permeate Salinities
    c. Permeate and Feed Flows
    d. Permeate and Feed Salinities

16. If RO System Has Feed Water TDS Concentration of 40,000 mg/L, Permeate TDS Concentration of 400 mg/L and Recovery Rate of 44%, What is The Salinity of the Concentrate Generated by This RO System?
    a. 69,800 mg/L
    b. 77,453 mg/L
    c. 71,114 mg/L
    d. 56,300 mg/L
17. What is the Salt Passage of RO Membrane Which Has TDS Concentration of the Feed Water of 990 mg/L and Produces Permeate of TDS Concentration of 80 mg/L?
   - a. 8.1%
   - b. 0.57%
   - c. 2.4%
   - d. 5.2%

18. What is The Salt Rejection of RO Membrane Which Has Feed TDS Concentration of 33,500 mg/L and produces Permeate of Salinity of 210 mg/L?
   - a. 99.4%
   - b. 89.4%
   - c. 99.8%
   - d. 76.2%

19. What is the TDS Concentration of Standard Sodium Chloride Solution Used for Determining Salt Rejection of Commercial SWRO Membranes?
   - a. 35,000 mg/L
   - b. 40,000 mg/L
   - c. 20,000 mg/L
   - d. 32,000 mg/L

20. What is the Typical Specific Permeability of Brackish Water RO Membranes?
   - a. 0.2 to 0.35 gfd/psi
   - b. 0.3 to 0.5 gfd/psi
   - c. 0.04 to 0.06 gfd/psi
   - d. 0.1 to 0.15 gfd/psi

21. Seawater Membranes Have Higher Permeability than Brackish Water Membranes – True or False?
   - a. True
   - b. False

22. What Are the Two Key Factors That Determine Membrane Concentration Polarization?
   - a. Permeate Flux and Feed Pressure
   - b. Permeate Flux and Feed Flow
   - c. Feed Flow and Permeate Salinity
   - d. Feed Water Salinity and Permeate Salinity

23. Water Transport Rate of RO Membrane is Proportional to Net Driving Pressure – True or False?
   - a. True
   - b. False

24. What Will Be the Impact of the Increase in Feed Water Salinity on the Permeate Flux?
   - a. Increase in Feed Water Salinity Will Increase Membrane Permeate Flux
   - b. Increase in Feed Water Salinity Will Have No Impact on Permeate Flux
   - c. Increase in Feed Water Salinity Will Decrease Membrane Permeate Flux

25. Membrane Salt Rejection Increases with RO System Recovery – True or False?
   - a. True
   - b. False

26. What Is the Effect of Temperature of the Feed Saline Water on the RO Membrane Rejection?
a. No Effect
b. RO Membrane Rejection Decreases with Increase in Feed Water Temperature
c. RO Rejection Increases with Increase in Feed Water Temperature

27. What is the Thickness of the Membrane Film Which Actually Separates Salts from the Water?
   a. 0.2 µm
   b. 40 µm
   c. 0.1 µm
   d. 100 µm

28. What is the Diameter of the Most Widely Used Spiral Wound, PA RO Membranes?
   a. 16 inches
   b. 4 inches
   c. 18 inches
   d. 8 inches

29. CA Membranes Have Higher Tolerance to Oxidants than PA Membranes – True or False?
   a. True
   b. False

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