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Continuing Education Course #454
Ion Exchange for Water Treatment

1. How does ion exchange work?
 - a. Exchanges anions for cations
 - b. Blocks charged particles from passing
 - c. Exchanges ions on the surface of resin
2. Which is NOT a purpose of ion exchange?
 - a. Softening
 - b. Grit removal
 - c. Deionization
3. Which ions do NOT contribute to hardness?
 - a. Calcium
 - b. Magnesium
 - c. Chloride
4. What is a commonly acceptable maximum hardness for public water treatment?
 - a. 60 mg/L
 - b. 600 mg/L
 - c. 6000 mg/L
5. Which is more expensive: deionization or distillation?
 - a. Deionization
 - b. Distillation
6. What kind of ion is Calcium (2+) ?
 - a. Cation
 - b. Anion
 - c. Neutral
7. What kind of ion is Nitrate (NO₃⁻) ?
 - a. Cation
 - b. Anion
 - c. Neutral
8. Acid is a regenerate for what type of IX?
 - a. Magnetic
 - b. Anion
 - c. Cation
9. What is a common application for salt-based water softeners?

- a. Municipal water plants
- b. Deionized water
- c. Residential

10. Which ion is preferred for removal with cation exchange?

- a. Iron
- b. Lead
- c. Hydrogen

11. What are chelating resins designed to remove?

- a. Heavy metals
- b. Sulfates
- c. Anions

12. Which is removed by anion exchange?

- a. Heavy metals
- b. Cyanide
- c. Ammonia

13. Which ion is preferred for removal with anion exchange?

- a. Bicarbonate
- b. Nitrate
- c. Hydroxide

14. Which is the most common IX configuration?

- a. Magnetic IX
- b. Fixed-bed, mixed stage
- c. Fixed-bed, single stage

15. Which exchanger is first for a multi-stage IX?

- a. Cation
- b. Anion
- c. Mixed

16. Which is true of magnetic ion exchange?

- a. Resin is low cost
- b. Pre-filtration is optional
- c. Acid regenerant can be used

17. Which configuration is only available with anion resins?

- a. Fixed-bed IX
- b. Suspended IX
- c. Magnetic IX

18. What contaminant can be removed with magnetic IX?

- a. Color
- b. pH
- c. Calcium

19. How prevalent is biological IX?

- a. Common
- b. Very uncommon

- c. Very common
20. What contaminant can be removed with biological IX?
- a. Iron
- b. Hardness
- c. Dissolved organics
21. Which is a type of field testing?
- a. Bench-scale test
- b. Smoke test
- c. Regression test
22. Which diagram is done first in the planning stage?
- a. Block flow diagram
- b. Process flow diagram
- c. Isometric
23. Which is NOT a common flow path for an IX system?
- a. Regeneration
- b. Backwash
- c. Concentrate
24. What is a common anion resin cost per cubic foot?
- a. \$50
- b. \$500
- c. \$5,000
25. Which is NOT normally included when calculating lifecycle cost?
- a. Capital cost
- b. Maintenance cost
- c. Insurance cost

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