Name _____

Iowa Water Treatment & Wastewater

I. Water Laws & Regulations

1. **Drinking water supplies in the United States are some of the best worldwide.**

   Circle One : True False

2. **Identify the intent of the Safe Drinking Water Act of 1974?**

   Ensure + protect the quality of Americans drinking water

3. **What government agency sets drinking water standards of the Safe Drinking Water Act?**

   Environmental Protection Agency

4. **Over how many different substances does the EPA set maximum contaminant levels?**

   90 +

5. **List the six groups of contaminants that the EPA regulates.**

   1. Microorganisms 2. Disinfectants 3. Disinfectant By-Products
   4. Inorganic Chemicals 5. Organic Chemicals 6. Radionuclides

6. **List two contaminants that the National Secondary Drinking Water Regulations address.**

   1. Cosmetic Effects Contaminants (skin, tooth discoloration) 2. Aesthetic Effects Contaminants (taste, odor, color)

II. Des Moines Water Treatment

1. **Match each step of water treatment with the correct definitions.** *(Steps in order of treatment)*

1. D.	Coagulation	A. Particles bind & form larger particles called flocs
2. A.	Flocculation	B. Clear water on top passes through filters to remove impurities
3. E.	Sedimentation	C. Disinfectants, such as chlorine, are added to kill microorganisms
4. B.	Filtration	D. Dirt & dissolved particles neutralized with added chemicals
5. C.	Disinfection	E. Flocs settle to the bottom of the water supply

2. **How many millions of gallons per day does each Des Moines Water Works plant treat?**

   Fleur Drive Treatment Plant : 100 MGD

   L.D. McMullen Treatment Plant at Maffitt Resrevoir : 25 MGD

   Saylorville Treatment Plant at Saylorville Reservoir : 10 MGD

3. **Identify the steps involved with treating water at each Des Moines water treatment plant.**

   Fleur Drive Treatment Plant

   1. Carbon added to reduce dissolved organic matter (pre-treatment)
   2. Bacteria removed (lime softening)
   3. Water filtered through sand/gravel (remove particles)
   4. Ion exchange removes nitrates
   5. Fluoride added / Chlorine added

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L.D. McMullen Treatment Plant

1. No pretreatment (no sediment in shallow groundwater)
2. Bacteria removed (lime softening)
3. Water filtered through sand/gravel (remove particles)
4. Nitrates not present (shallow groundwater vs. river)
5. Fluoride + chlorine added

Saylorville Treatment Plant

1. Pretreatment (oxidation + removal of Iron + Manganese)
2. Ultra Filtration removes virus bacteria, giardia
3. Reverse Osmosis Filtration (removes hardness, nitrates)
4. Fluoride, chlorine, + sodium hydroxide added
5. (cavities) (disinfect) (pH adjustment)

4. Identify the following amounts of the Des Moines Water Works distribution system.

1,360 miles of pipe — 8,900 fire hydrants

9,700 valves — 10 water storage tanks

10 booster pumping stations

III. Davenport Wastewater Treatment

1. Match each step of wastewater treatment with the correct definitions. *(Steps in order of treatment)*

1. E.	Pretreatment	A. Secondary tank; Bacteria degrade human waste, food wastes, etc.
2. D.	Primary Treatment	B. Extra filtration, nitrogen/phosphorus removal, and/or chlorination
3. A.	Secondary Treatment	C. Activated carbon or ozone applied to remove micropollutants
4. B.	Tertiary Treatment	D. Primary tank; Sludge settles to bottom; Grease/oil skimmed off
5. C.	Fourth Stage	E. Trash, tree limbs, leaves, branches, and large objects removed

2. How many million gallons per day of wastewater flow through the Davenport Wastewater Plant?

22 MGD

3. Identify the following amounts of incoming wastewater and effluent (exiting).

	Total Suspended Solids	Carbonaceous Biochemical Oxygen Demand
Incoming:	200 mg/L	150 mg/L
Effluent:	below 15 mg/L	below 15 mg/L

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4. Identify the steps involved with treating wastewater at the Davenport plant.

1. Preliminary Treatment (Screening)
   1. 96 inch wide pipe (45 ft. belowground) deliver water
   2. Initial wastewater = 99.5% water; 0.5% pollutants
   3. Bar screen traps large solids (plastics, sticks, cans)
   4. Giant rake cleans bar screen (Solids in hopper (hopper?) sent to land fill)
2. Primary Treatment (Settling/ Floating)
   1. Wastewater enters 1 of 4 clarifier tanks (1.3 million gallons)
   2. Heavy solids removed after settling (2-4 hours)
   3. Grease + floatable materials skimmed off (removed)
   4. (65% of organic solids removed here)
3. Secondary Treatment (Activated Sludge)
   1. Flow moves from primary tank to activated sludge area
   2. Nutrient-rich wastewater mixed with air in 8 tanks (750,000 gallons each)
   3. Oxygen provided for microorganisms (bacteria, fungi, protozoa)
   4. Microorganisms consume pollutants (6 hour exposure)
4. Additional Treatment
   1. Wastewater sent to secondary clarifiers (4 total)
   2. Flow moves to secondary clarifiers (5 hours)
   3. Flow settles in activated sludge area (returned to aeration)
   4. Skimmer removes any floating material

5. What percentage of removed wastes does the National Pollution Discharge Elimination System permit require of the Davenport Wastewater Treatment facility?

85 %

6. What is the average removal rate of wastes from the Davenport Wastewater Treatment Plant?

90+ %