A. Multiple Choice Questions (10 points/question) (Only one correct answer)

1. What is the equivalent weight (E.W.) of $Ca(OH)_2$: (A) 111 (B) 74 (C) 37 (D) 18.5. (Atomic weight: Ca: 40)

2. How many grams of $AgNO_3$ are required to prepare 1 L of a 0.2 N solution to be used in a precipitation reaction?　(A) 170 (B) 17 (C) 8.5 (D) 108. (Atomic weight: Ag: 108)

3. Regarding the **alkalinity**, which following statement is **true**?

(A) $[Alk] = [HCO_3^-]+[CO_3^{2-}]+[OH^-]-[H^+]$

(B) phenolphthalein alkalinity is determined by titration with acid to the pH at which HCO_3^- is the predominant carbonate species

(C) total alkalinity is determined by titration with acid to the pH at which CO_3^{2-} is the predominant carbonate species

(D) total alkalinity is determined by titration with acid to pH 8.3.

4. Regarding **secondary wastewater treatment**, the **true** statement of the following is (A) the activated sludge process is predominantly a physical/chemical process, (B) the activated sludge process gets rid of all of the sludge as soon as it is made, (C) trickling filters make use of a mass of biological sludge that is continuously pumped over the filter, (D) the trickling filter is an aerobic treatment process, (E) excess sludge from activated sludge treatment is likely to undergo the process represented by $2\{CH_2O\}+ O_2 \rightarrow CH_4 + CO_2$.

5. Regarding **sewage wastewater treatment**, the **false** statement of the following is (A) primary treatment is designed to remove the insoluble matter, (B) secondary treatment is designed to remove COD (chemical oxygen demand), (C) rotating biological reactor is an attached growth process, (D) most secondary treatments utilize biological processes, (E) approximately 40% of organic matter in wastewater goes to oxidation pathway.

6. Of the following, the **true** statement pertaining to **water disinfection** is (A) disinfection with ozone is particularly desirable because the ozone persists throughout the water distribution system, (B) disinfection with ozone is noted for producing toxic organic byproducts, (C) chlorine dioxide, ClO_2, is an effective water disinfectant that does not produce impurity trihalomethanes in water treatment, (D) the main disadvantage of chlorination of water is that Cl_2 gas is the only effective chlorinating agent, (E) organic substances are left in water to be treated by chlorine to retain disinfecting capacity in the water.

7. Of the following, the **true** statement regarding **activated sludge (AS) process** is (A) AS process is an attached growth process, (B) about 40% of organic matter goes to synthesis pathway, (C) the purpose of return sludge is to lower the level of the microorganisms in the aeration tank, (D) AS process is an anaerobic process, (E) Some of the soluble organic matter is incorporated into biomass that settles from suspension.

B. Matching Items (10 point/question)

1. Match the pollutant or impurity on the left with a reagent used to treat it from the list on the right, below:

(A) Mn^{2+}	1. Activated carbon
(B) PCB	2. Raise pH by addition of Na_2CO_3
(C) Colloidal matter	3. $Al_2(SO_4)_3 \cdot 18\ H_2O$
(D) Mg^{2+}	4. Oxidation

2. Match each compound or chemical in the left column with its related process in the right column.

(A) methane	1. Nitrification
(B) ammonium	2. Ion exchange
(C) ozone	3. Anaerobic digester
(D) sodium chloride	4. Disinfection

3. Match the pollutants on the left with effects or other significant aspects on the right, below:

(A) Salinity	1. From soil and mineral strata
(B) Alkalinity	2. Can enter water from pyrite or from the atmosphere
(C) Acidity	3. Osmotic effects on organisms
(D) Nitrate	4. Excessive productivity