1. AM stands for “Amplitude Modulation” the amplitude of the carrier wave is varied to produce a signal. FM stands for “Frequency Modulation” the frequency of the carrier wave is varied to produce a signal.

2.1 The water can heat up and expand, cracking the ceramic.
2.2 Aluminum can carry an alternating electric current in a microwave oven. This can cause static charge build-up and sparks and hot-spots. These problems are avoided if you use non-conducting containers, such as plastic or cardboard.
2.3 The microwaves emitted by the microwave lamp are normally trapped within the oven by the conducting walls and door. If the shut-off switch is faulty, and the microwaves escape, they can heat up the water in your hand and burn you.

3.1 Use the equation $E = h \times f$, where $h=\text{Planck's constant}, 6.6\times10^{-34} \text{ J}\cdot\text{s}$, and $f$ is the frequency. In our case we have $E = (6.6\times10^{-34} \text{ J}\cdot\text{s})(5.08\times10^{14} \text{ s}^{-1}) = 3.4 \times10^{-19} \text{ J}$.
3.2 Use the equation $E = h \times f$, where $h=\text{Planck's constant}, 6.6\times10^{-34} \text{ J}\cdot\text{s}$, and $f$ is the frequency. In our case we have $E = (6.6\times10^{-34} \text{ J}\cdot\text{s})(1.2\times10^{19} \text{ Hz}) = 8.0 \times10^{-15} \text{ J}$.
3.3 The X-ray photons can do more damage, because their energies are much greater.

4. If you wish to see the fish, you need to reduce the glare from light reflected from the surface. These reflected rays have horizontal polarization (parallel to the surface). Therefore, the glasses should block horizontally polarized light.
Some suggested problems (not to be turned in):

Practice 1. The environment around your microwave is full of 2.45 GHz microwaves leaking from the oven. It’s not enough to harm you, but it would interfere with your phone!

Practice 2. The frequency will not change. The wavelength is found from $v = \lambda f$, or $\lambda = \frac{v}{f}$, where $v$ is the speed of light, $\lambda$ is the wavelength, and $f$ is the frequency. In water, the frequency is constant, but the speed of light decreases. Therefore, the wavelength decreases.

Practice 3. The air around us which extends to about 10 km overhead scatters sunlight in all directions. The scattered sunlight overpowers the light from the stars, and we don’t see them.

Practice 4. The granulated sugar scatters white light in all directions, because of the many various reflecting surfaces. The block of sugar is made of the same material, but it has fewer surfaces, so there aren’t all the reflections, and less light reflects into our eyes.