Optics - Fishtank Observations

Name: _____

On separate sheets of paper, answer the following questions – they are guides for observing. Include this sheet and your answers as a part of your MLB writeup for this activity.

1. Put yourself at the very edge of the fishtank and look down at your reflection. Try to directly compare the size of the part of your body closest to the surface with the size of your reflected head. Are the laws of perspective preserved? How do you know? *Make a drawing of this view that will go in your MLB.*

2. Crouch down and get one eye near the water, and look at the far side of the fishtank. Hold an object such as a ruler at the far end at the surface of the water. How do objects at the edge of the far side appear in the water? What is the size and position of their reflections with respect to the real objects? Make a drawing of this view that will go in your MLB.

3. With your eye close to the water, compare the far scene (seen in the water near the far edge of the tank) and the near scenes (seen at a steeper angle nearer to your eye) that are reflected in the water. Are they different? How?

4. Walk along the perimeter of the tank. How do the objects and their reflections appear to move with respect to the water?

5. Compare color, brightness, perspective, etc. of reflections and their objects. Does the angle at which you look at the water change any of these things?

6. Put your eye as close to the level of the water as you can, and pick a certain point on the surface of the water that is close to you. Now slowly stand up, keeping your eye on the same spot on the surface of the water. How does the *reflection* at that point change?

7. What surfaces act as mirrors? (Look all around and from as many angles as possible.) Do the surfaces that act as mirrors *always* act as mirrors, or does the mirror effect change? If so, under what conditions?

8. If the water is moving or rippling, what do we *actually see* that indicates this?

9. Crouch down so you have an oblique view into the water, and with a meter stick that isn't in the water at all, visually aim at a target object on the bottom of the fishtank on the side farthest from you (so it is not directly below your gaze). You could use the corner of the fishtank as your object. Once you have aimed your meter stick, you are not allowed to change the way it points, so keep it steadily along the original line in which it points, and slowly move the meter stick into the water - do you hit the object on the first try?

10. Repeat the above procedure, and e-aim your meter stick until you figure out where you have to aim so that you hit the object. Sight along your stick once you have it touching the object in the water: what do you observe? Examine the obliquely submerged meter stick from many angles. Based on the above procedure, now compare the spatial relationships given by our visual sense and by our touch sense. If you wish, use your arm and hand as the 'meter stick' – otherwise, imagine that your meter stick was your arm and hand. What can you conclude about the 'visual space' and the 'tangible space'? *Make a drawing for your MLB of the meter stick that is half submerged obliquely into the water based on your observations above.*

11. Look directly downwards (gaze perpendicular – and *normal* – to the water) at an object or the bottom of the fishtank through the water. Where does the bottom of the fishtank *appear* to be?

12. Try crouching higher and lower. How does this affect the degree of "lifting" of objects viewed below the surface? Is there a limit to the angles at which you can see a submerged object? .

13. Consider the overall colors seen in the lake. Note the color of the water: is it different in the center of the fishtank vs. at the edges?

14. Try to find a bright or white object that is submerged in a deep area of the fishtank, preferably with a dark background. Try to notice any color effects (you can take the object out to compare an "unaltered" view). Pay particular attention to the edges/boundaries of objects.

15. Compare this with a submerged dark or black object on a light background. Is it similar or different than the first object?

16. Can you make any generalizations about color from these observations? *Make drawing for your MLB of any color effects you observe with these objects.*