1. LIGHT/WAVES

In a classroom demonstration, a beam of coherent light of wavelength 550 nm is incident perpendicularly

onto a pair of slits. Each slit has a width *w* of 1.2 x 10-6 m, and the distance *d* between the centers of the

slits is 1.8 x 10-5 m. The class observes light and dark fringes on a screen that is a distance *L* of 2.2 m

from the slits. Your notebook shows the following setup for the demonstration.



(a) Calculate the frequency of the light.

(b) Calculate the distance between two adjacent dark fringes on the screen.

The entire apparatus is now immersed in a transparent fluid having index of refraction 1.4.

(c) What is the frequency of the light in the transparent fluid?

(d) Does the distance between the dark fringes increase, decrease, or remain the same?

\_\_\_\_\_ Increase \_\_\_\_\_ Decrease \_\_\_\_\_ Remain the same

Explain your reasoning.

2. FLUIDS



Three objects of identical mass attached to strings are suspended in a large tank of liquid, as shown above.

(a) Must all three strings have the same tension?

\_\_\_\_ Yes \_\_\_\_ No

Justify your answer.

Object A has a volume of 1.0\_10-5 m3 and a density of 1300 kg m3 . The tension in the string to which

object A is attached is 0.0098 N.

(b) Calculate the buoyant force on object A.

(c) Calculate the density of the liquid.

(d) Some of the liquid is now drained from the tank until only half of the volume of object A is submerged.

Would the tension in the string to which object A is attached increase, decrease, or remain the same?

\_\_\_\_ Increase \_\_\_\_ Decrease \_\_\_\_ Remain the same

Justify your answer.

3. THERMODYNAMICS – Figure it out using your textbook!!!!

The cylinder represented above contains 2.2 kg of water vapor initially at a volume of 2.0 m3 and an absolute pressure of 3.0 ¥ 105 Pa. This state is represented by point *A* in the *PV* diagram below. The molar mass of water is 18 g, and the water vapor can be treated as an ideal gas.



(a) Calculate the temperature of the water vapor at point *A*.

The absolute pressure of the water vapor is increased at constant volume to 4.0 ¥ 105 Pa at point *B*, and then the

volume of the water vapor is increased at constant pressure to 2.5 m3 at point *C*, as shown in the *PV* diagram.

(b) Calculate the temperature of the water vapor at point *C*.

(c) Does the internal energy of the water vapor for the process *A*→*B*→*C* increase, decrease, or remain the

same?

\_\_\_\_Increase \_\_\_\_Decrease \_\_\_\_Remain the same

Justify your answer.

(d) Calculate the work done on the water vapor for the process *A*→*B*→*C*.