PHY138-Y1Y

Waves Quarter – Written Team Problem Set

Prof. Jason Harlow

This homework assignment is due by 5PM on Friday November 23. It should be submitted in the *Drop Box* for your tutorial. The Drop Boxes are located in the basement of the Burton tower of McLennan. On the first floor of McLennan there is a stairway with a bust of Newton beside it; the Drop Boxes are at the bottom of that stairway.

	This page must be the first page of the submitted Problem Set.	

You must solve the problems together in the same team that you have been working with in your tutorials.

	Problem Sets done by a single individual will not be accepted.	

By filling out and signing the form below, I certify that I took an active role in the solution of all the problems of this problem set.

Name (Please Print)	Signature

Designate one member of your team as the *coordinator*. The coordinator will be responsible for assembling the final copy of your solutions and submitting them in the Drop Box on time.

The coordinator should fill out this form:

Name of Your PHY138 Tutor	
Tutorial Group	
Tutorial Day	
Tutorial Time	
Coordinator's (your) Name	

1. (**15 points**) Do not stick anything into your ear! Estimate the length of your ear canal, from its opening at the external ear to the eardrum. If you regard the canal as a narrow tube that is open at one end and closed at the other, at approximately what fundamental frequency would you expect your hearing to be most sensitive? Explain why you can hear especially soft sounds just around this frequency.

2. (**20 points**) When mass *M* is tied to the bottom of a long, thin wire suspended from the ceiling, the wire's second-harmonic frequency is 250 Hz. Adding an additional 1.0 kg to the hanging mass increases the second-harmonic frequency to 305 Hz. What is *M*?

3. (**15 points**) The Bay of Fundy, Nova Scotia, has the highest tides in the world. Assume that in midocean and at the mouth of the bay, the Moon's gravity gradient and the Earth's rotation make the water surface oscillate with an amplitude of a few centimeters and a period of 12 hours and 24 minutes. At the head of the bay, the amplitude is several metres. Argue for or against the proposition that the tide is magnified by standing wave resonance. Assume that the bay has a length of 210 km and a uniform depth of 36.1 m. The speed of long-wavelength water waves is given by $\sqrt{gd}$, where *d* is the water's depth.

4. (**25 points**) Knight Problem 21.62

5. (**25 points**) Knight Problem 21.75