Wave Motion and Sound Problem Set – Answer Key

1. Speed of sound does not change, wavelength becomes 2/3 of what it was (vibrating string creates the sound) – use wave equation

V=fλ, (260Hz)(λ) = f(2/3λ) so f = (3/2)(260Hz) = 390Hz

1. a) 4 Hz b) vibration frequency corresponded to resonant frequency

c) whenever there is a node at each end of the bridge. Simplest case would be no nodes in between.

d) add extra supports along the span – this would increase the number of stationary points (nodes) and decrease the number of possible frequencies at which the bridge could experience resonant vibrations.

4. a) each estimate would be different, but in the range of 1-2 seconds

b) If period = 1.5 seconds, f= 0.67 Hz

c) v = fλ, λ = v/f = 3200/0.67 = 4800m

5. a)

F = v/λ = 3200/2700= 1.2 Hz

c) could cause very strong vibrations of the bridge

6. v = 331.4 m/s + 0.6(10 C) = 337.4m/s for 10 C

d = vt = 337.4 m/s X 5 s = 1687 m – round to 1700m for sf

7. a) λ = v/f = 343/20 000 = 1.7cm

b) 343/20 = 17m