Departement Physik
Universität Basel
Prof. M. Poggio / PD Dr. M. Calame
T. Meier / C. Drechsel
tobias.meier@unibas.ch
c.drechsel@unibas.ch
Büro 3.04
Tel.: 061 207 37 30
http://adam.unibas.ch

Exercises and Complements for the Introduction to Physics I for Students of Biology, Pharmacy and Geoscience

Sheet 10 / November 7, 2017 Discussion of the Exercises: **28.11.2017/29.11.2017**

Exercise 40.
A wave has a wavelength of $\lambda = 34$ cm and period of $T = 1.0$ ms. Calculate the frequency f, the velocity of propagation v, the angular frequency ω and the wave number k.

Exercise 41.
The human ear can detect acoustic waves in the frequency range between 16 Hz and maximum 20kHz. What is the spectrum of wavelength which are covered in the range of audibility? How is the situation changing in a He atmosphere (calculate the range of audibility in a He atmosphere)?

Exercise 42.
Two waves are moving in the same direction along a string. They have the same frequency of 100 Hz, same wavelength of 2 cm and also the same amplitude of 2 cm.

(a) How big is the amplitude of the resulting wave, if the phases are shifted by $\pi/6$ respectively $\pi/3$?
(b) How big is the phase difference if the resulting amplitude is equal to the original amplitude of the waves?

Exercise 43.
You are standing at a street when an ambulance is passing by and it has the alarm horn ($f = 550$ Hz) on. The ambulance is passing you with a constant velocity of $v_K = 120$ km/h.

(a) What are you observing if you pay attention to the sound (frequency) of the alarm?
(b) What is the frequency of the sound which you hear when the ambulance is driving towards you respectively when it is driving away from you?

Additional Exercise (for students which are looking for a challenge - not relevant for the exam).
On a rope a harmonic wave (wavelength $\lambda = 3$ m, amplitude $y_0 = 5.0$ cm and frequency $f = 4.0$ Hz) propagates in positive x-direction.

(a) A wave trough (minimum) is found at the distance $x = \lambda/2$ from the position of the excitation of the wave, at time $t = 0$. Write down the equation for the corresponding wave function $y(x, t)$.

(b) Calculate the tension force of the rope if the linear density is 0.4 kg/m.

Solutions:

Exercise 40. $f = 1$ kHz, $c = 340$ m/s, $\omega = 6.28 \cdot 10^3$ s^{-1}, $k = 18.5$ m^{-1}

Exercise 41. $\lambda = 17$ mm ... 21 m in air and $\lambda = 50$ mm ... 63 m in He

Exercise 42. (a) 3.86 cm and 3.46 cm (b) 120°

Exercise 43. 610 Hz respectively 500.9 Hz

Additional Exercise: (b) 57.6 N