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

Sheet 11 / 26.11.2020 Zoom - Q&A on the Exercises: **01.12.2020/02.12.2020**

Exercise 51.

The frequencies of three successive harmonic series of an organ pipe are 1310 Hz, 1834 Hz and 2358 Hz.

(a) Is the pipe open or closed?
(b) What is the fundamental frequency?
(c) How long is the pipe?

Exercise 52.

A detonation at the Earth's surface generates a compression wave. This wave propagates into the ground and gets reflected at a rock formation. At the Earth's surface, it is received at a distance of $x = 200$ m after $t = 0.1$ s. How deep under the Earth's surface is the rock formation, if the propagation velocity of the compression wave is $c = 2200$ m/s?

Exercise 53.

(a) A single thunder whistle can reach in small distances a noise level of 120 dB. Which noise level is reached by 10 whistling people, who are in the same small distance from the listener?
(b) A drum reaches in small distances a noise level of about 100 dB. How many drummers in the same distance are needed to exceed the pain threshold of 130 dB?

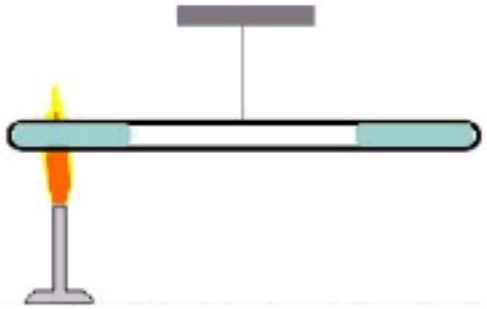
Exercise 54.

K or °C? Solve the following:

(a) Convert 30 °C into Kelvin.
(b) At how much °C is the absolute zero point? At which temperature in Kelvin does water boil?
(c) What is the temperature of a piece of iron which originally had a temperature of 77 K and got heated up by 70 °C?

Exercise 55.

A glass tube is filled on both ends with mercury and in between with air. It is hanging from a thread and is in mechanical equilibrium. The tube gets heated up on the left side, see figure. Does the left side sink or rise if you neglect the expansion of the glass?



What happens if you make the same experiment with an iron tube? For both cases neglect the forces which are acting due to the flow of hot air.

Solutions

Exercise 51. (b) 262 Hz, (c) 0.324 m

Exercise 52. 45.8 m

Exercise 53. (a) 130 dB, (b) $n \geq 1000$

Exercise 54. (a) 303.15 K, (b) -273.15 °C and 373.15 K, (c) 147 K or -126.15 °C