

## Exercises for Experimental Physics 1 – IPSP

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### Exercise Sheet 3 (WS 2011/12)

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#### Exercises:

1. Calculate the following, round off to the correct number of significant figures, and express your result in scientific notation: (a)  $(1.14)(9.99 \cdot 10^4)$ , (b)  $(2.78 \cdot 10^{-8}) - (5.31 \cdot 10^{-9})$ , (c)  $12\pi/(4.56 \cdot 10^{-3})$ , (d)  $27.6 + (5.99 \cdot 10^2)$ .
2. The Super-Kamiokande neutrino detector in Japan is a large transparent cylinder filled with ultra pure water. The height of the cylinder is 41.4 m and the diameter is 39.3 m. Calculate the mass of the water in the cylinder. Does this match the claim posted on the official Super-K Web site that the detector uses 50000 tons of water?
3. An object that is launched straight up from the ground, reaches a maximum height  $H$ , and falls straight back down to the ground, hitting it  $T$  seconds after launch. Neglect any effects due to air resistance. (a) Express the average speed for the entire trip as a function of  $H$  and  $T$ . (b) Express the average speed for the same interval of time as a function of the initial launch speed  $v_0$ .
4. A turtle, seeing his owner put some fresh lettuce on the opposite side of his terrarium, begins to accelerate (at a constant rate) from rest at time  $t = 0$ , heading directly toward the food. Let  $t_1$  be the time at which the turtle has covered half the distance to his lunch. Derive an expression for the ratio of  $t_2$  to  $t_1$ , where  $t_2$  is the time at which the turtle reaches the lettuce.
5. On June 14, 2005 Asafa Powell of the Jamaica set a world's record for the 100-m dash with a time  $t = 9.77$  s. Assuming he reached his maximum speed in 3.00 s, and then maintained that speed until the finish, estimate his acceleration during the first 3.00 s.