

# Exercises and Complements for the Introduction to Physics I

## for Students

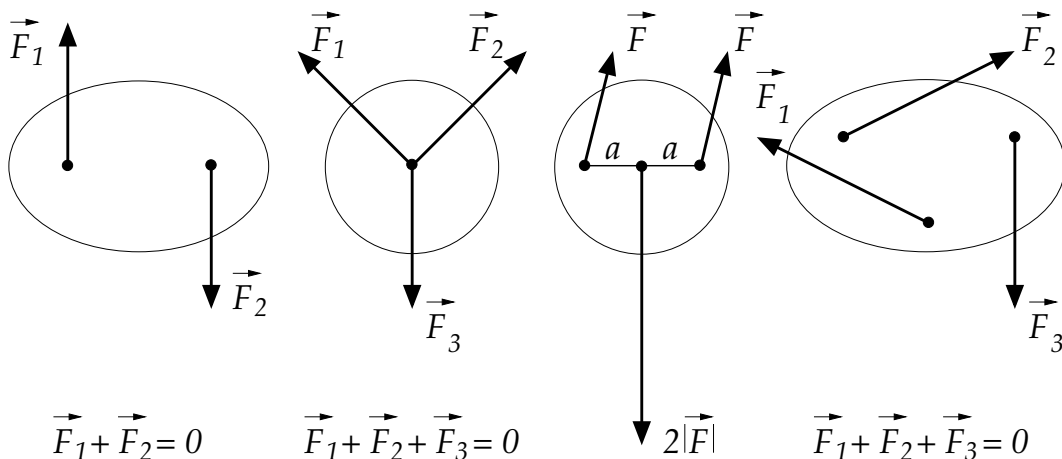
### of Biology, Pharmacy and Geoscience

Sheet 4 / September 26, 2017

Discussion of the Exercises: 17.10.2017/18.10.2017

#### Exercise 14.

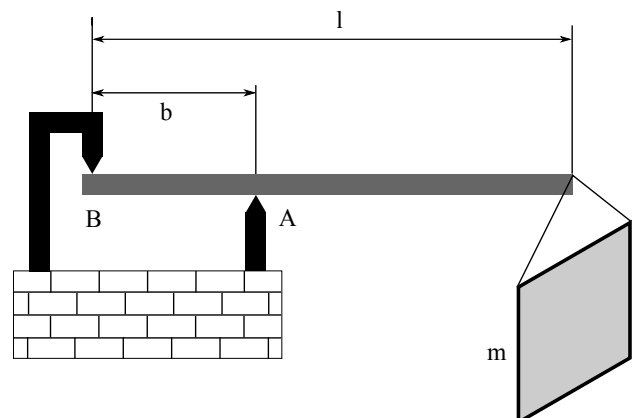
4 Cases: is the system in equilibrium or not? Give reasons for your answer.



#### Exercise 15.

A horizontal flagpole (own weight  $M=5.2$  kg, length  $l=2.0$  m,  $b=0.5$  m) is mounted on a roof overhang as shown in the figure. At the end of the pole a poster is attached which has a mass of  $m=8.0$  kg.

- Sketch all the forces which act on this system.
- Calculate the supporting force at the position A and B.

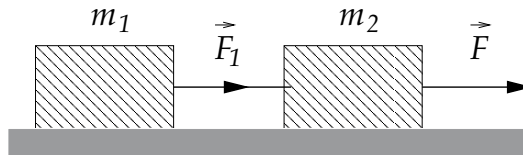


### Exercise 16.

An object obtains an acceleration of  $1.5 \text{ m/s}^2$  while sliding down an inclined plane which has a angle of  $20^\circ$ . How big is the coefficient of sliding friction  $\mu_g$ ? How big must the coefficient of static friction  $\mu_H$  be for the limiting case such that the object does not move/slide?

### Exercise 17.

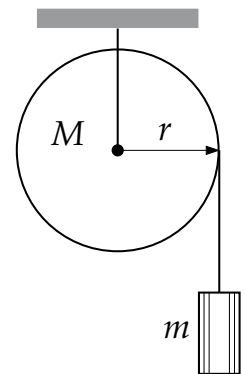
Two masses  $m_1$  and  $m_2$  are connected with a thin rope. The dynamic friction of the masses on the support plate is  $\mu_g$ . A force  $\vec{F}$  acts on mass  $m_2$ , see figure.



- (a) How big is the acceleration  $\vec{a}$  of the masses?
- (b) How big is the force  $\vec{F}_1$ ?

### Additional Exercise (for students which are looking for a physical challenge - not relevant for the exam)

A mass  $m$  is attached to a light string and the string is wound around a solid cylinder with a mass  $M$  and a radius  $r$ , see figure. The wheel bearing is frictionless and the string is not sliding on the cylinder. Determine the angular frequency of the cylinder as a function of time and sketch it.



### Solutions:

Exercise 15. 415.9 N and 286.4 N

Exercise 16. 0.2 and 0.36