

CoLoS

Fall 1999

Test about basic knowledge in mechanics

Date:

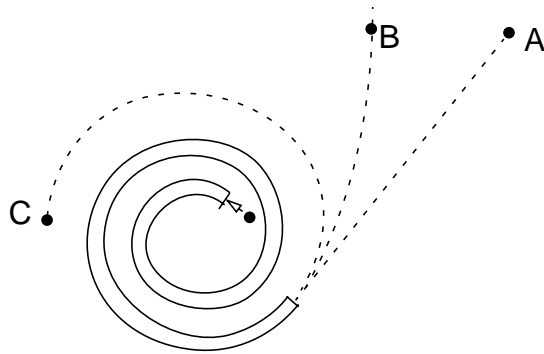
Name:

Age:

Class:

Question 1

The following figure shows a spiral tube lying flat on a table, seen from above.

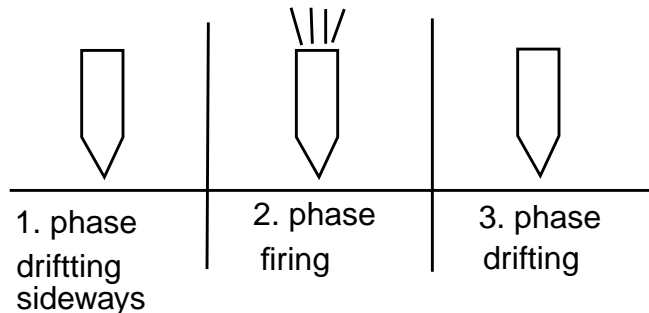


A ball enters the tube with a sufficiently high velocity to emerge from the other end. What path does it take when it comes out of the tube?

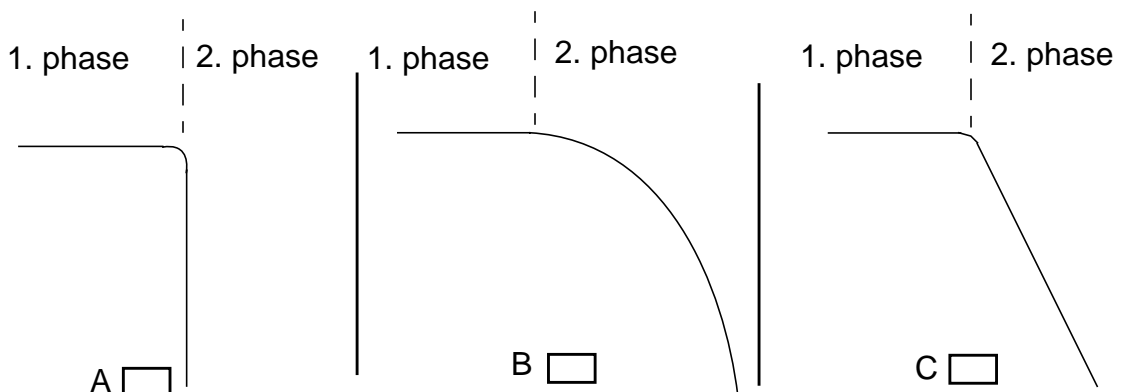
- A ☐
- B ☐
- C ☐

Question 2

Imagine a space shuttle drifting along sideways in space, with its engines off and so far away from any other planet that there is no influence from outside (1. phase). Suppose that the pilot starts the rocket engine, runs it for a certain length of time (2. phase) and then shuts it off (3. phase).



2.1 What path would the space shuttle take while the engine is firing?



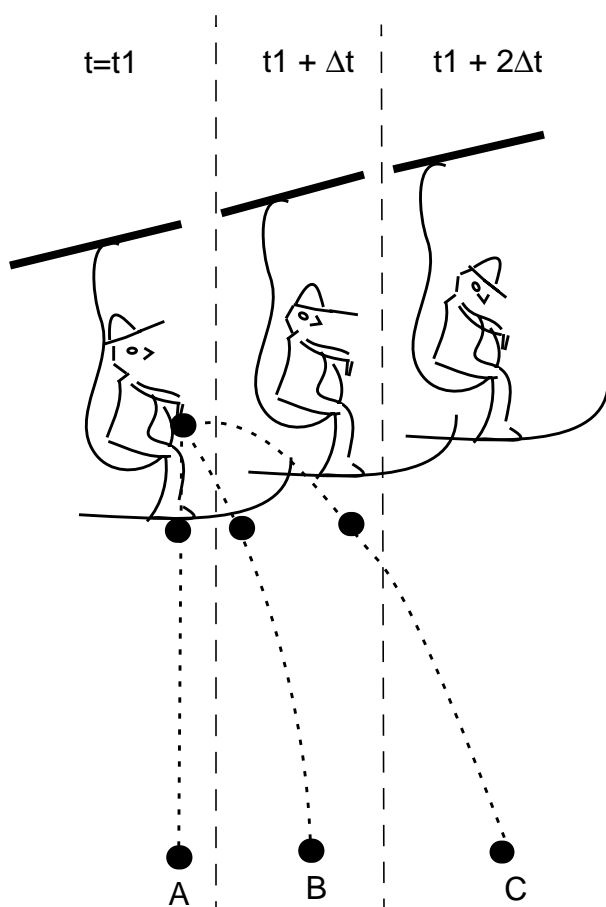
2.2 What path would the shuttle take after the engine has stopped?

- a) The space shuttle will go back to drifting sideways again.
- b) It will keep drifting in its new direction of motion.

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Question 3



The figure shows a single man on a lift at three consecutive moments in time, moving to the right and upwards.

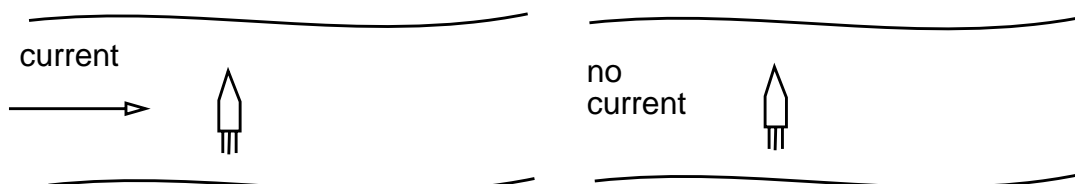
At time t_1 the man drops a ball. Which path will the ball take as it falls to the ground?

- A ☐
 B ☐
 C ☐

Question 4

Two identical boats are crossing two rivers of the same width. In one river a current is flowing while in the other there is no current. Both boats have the same motors and leave at the same time.

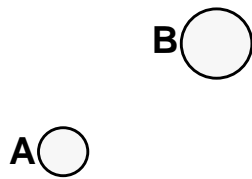
Which boat gets to the other side first?



- (a) The one crossing the river without a current flowing. ☐
 (b) The one crossing the river with a current flowing. ☐
 (c) Both boats get to the other side at the same time. ☐

Question 5

Two balls of different weight (B is heavier than A) are dropped at the same moment but from different heights (see figure).



5.1. Which of the following statements is correct?

(a) The lower ball hits the ground first. ☐

(b) The higher ball hits the ground first. ☐

(c) Both balls hit the ground at the same time, if the difference in distance of fall corresponds to the difference in weight. ☐

5.2 Which ball is going faster when it hits the floor?

a) ball A. ☐

b) ball B. ☐

c) both balls are going the same speed when they hit the floor. ☐

Question 6

A car (A) is driving in the positive x-direction and is slowing down. A second car (B) is driving in the opposite direction and is getting faster.

Which of the following statements is correct?

a) The acceleration of car A is negative, that of car B is positive ☐

b) The acceleration of car A is positive, that of car B is negative ☐

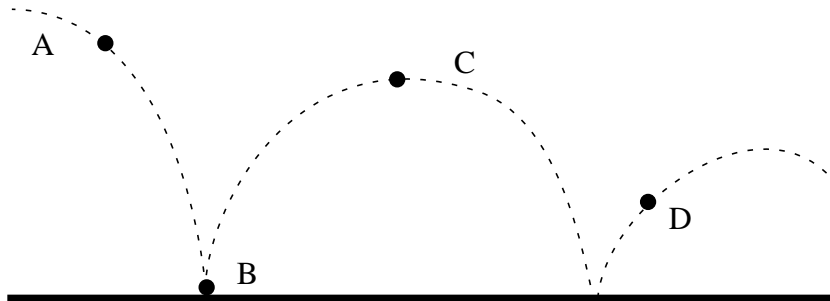
c) The acceleration of both cars is negative ☐

Question 7

If friction can be neglected, all objects drop to the earth with the same acceleration, independent of their mass. What is, in a nutshell, the main reason for this fact?

Question 8

A steel ball is thrown onto a steel plate and is moving along the path shown in the figure.

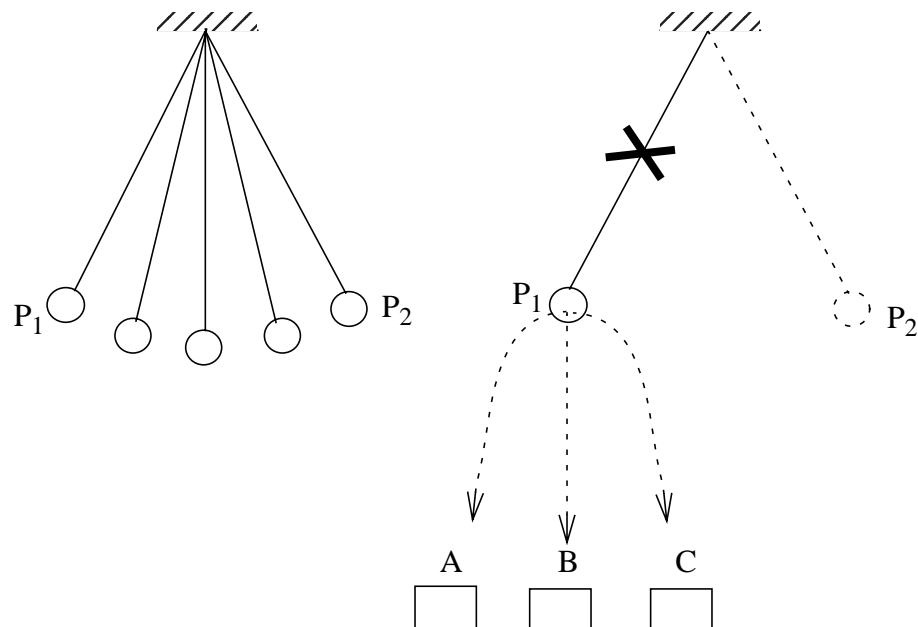


Please draw the acting force as vector at the positions A, B, C and D.

Question 9

Suppose that a ball is attached to a string and swung back and forth between P_1 and P_2 like a pendulum.

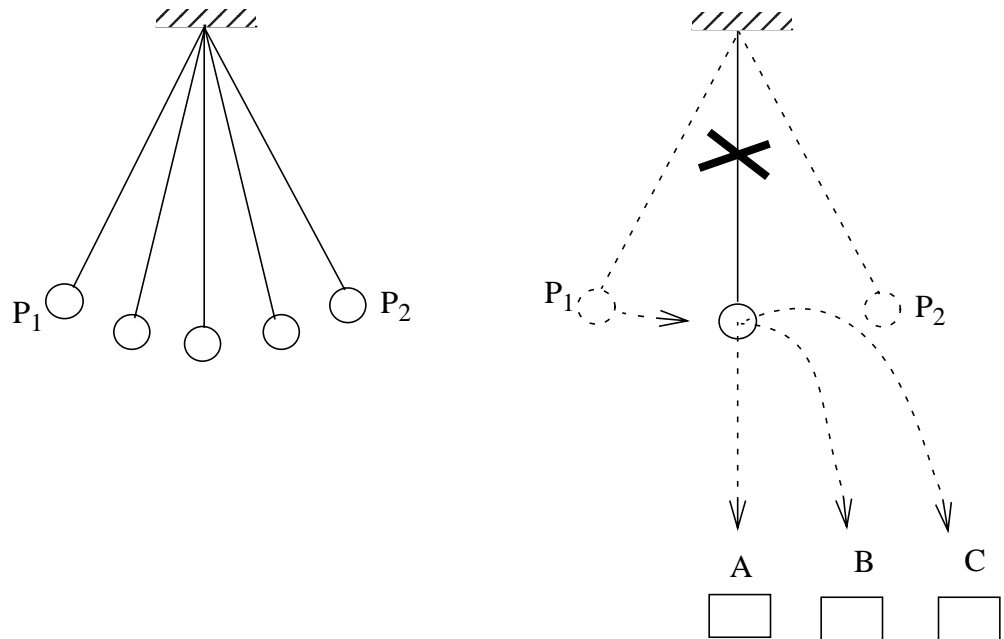
If you cut the ball when the ball is at the far end of its swing, which path would the ball take as it falls to the ground?



Please explain the arguments behind your choice.

Aufgabe 10

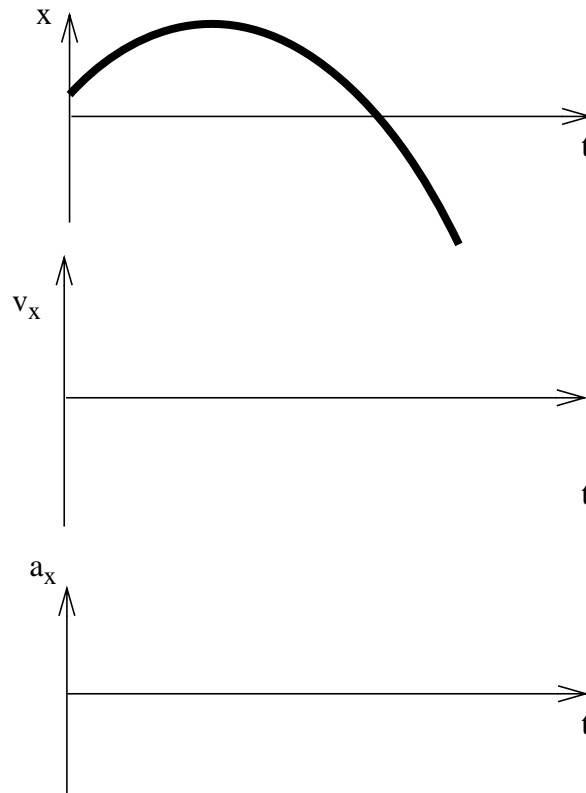
The process of the question 9 is repeated. This time, however, the string is cut when the ball is in the middle of its swing.



Which path would the ball take as it falls to the floor?
Please explain the arguments behind your choice.

Question 11

The following graph shows the time dependence of the x-coordinate of a movement along the x-axis. The curve corresponds to a parabola.



Please draw the curves for the time dependence of the corresponding velocity and acceleration (only qualitatively).

Question 12

Two objects are dropped from a height of 10 m, one here on earth and one on the moon. The object on the moon is 6 times as massive as the one on earth.

The constant g on the moon is 6 times smaller than on the earth.

Which of the following statements is correct:

- a) The falling time on earth is shorter
- b) The falling time on earth is longer
- c) The falling times are equal

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Please explain your answer briefly.