

Test exam for Experimental Physics 1 (IPSP) (WS 2011/12)

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This test exam is just for practice, you should answer the questions within 90 min. There is

NO homework for the X-mas holidays!

Please note: The lecture on Friday 6th 2012 is cancelled, but we will hand out a new homework sheet.

MERRY X-MAS and A HAPPY NEW YEAR!!!

Exercises:

1. Name Newton's 3rd law!
2. 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.
3. A plane flies at an airspeed of 250 km/h. A wind is blowing at 80 km/h toward the direction 60° east of north. (a) In what direction should the plane head in order to fly due north relative to the ground? (b) What is the speed of the plane relative to the ground?
4. An airplane is flying in a horizontal circle at a speed of 480 km/h. The plane is banked for this turn, its wings tilted at an angle of 40° from the horizontal (Figure 1). Assume that a lift force acting perpendicular to the wings acts on the aircraft as it moves through the air. What is the radius of the circle in which the plane is flying?
5. Particle a has mass m , is initially located on the positive x -axis at $x = x_0$ and is subject to a repulsive force F_x from particle b . The location of particle b is fixed at the origin. The force F_x is inversely proportional to the square of the distance x between the particles. That is, $F_x = A/x^2$, where A is a positive constant. Particle a is released from rest and allowed to move under the influence of the force. Find an expression for the work done by the force on a as a function of x . Find both the kinetic energy and speed of a as x approaches infinity.
6. A 3.0-kg block slides along a frictionless horizontal surface with a speed of 7.0 m/s (Figure 2). After sliding a distance of 2.0 m, the block makes a smooth transition to a frictionless ramp inclined at an angle of 40° to the horizontal. What distance along the ramp does the block slide before coming momentarily to rest?
7. During a pool game, the cue ball, which has an initial speed of 5.0 m/s, makes an elastic collision with the eight ball, which is initially at rest. After the collision, the eight ball moves at an angle of 30° to the right of the original direction of the cue ball. Assume that the balls have equal masses. (a) Find the direction of motion of the cue ball immediately after the collision. (b) Find the speed of each ball immediately after the collision.

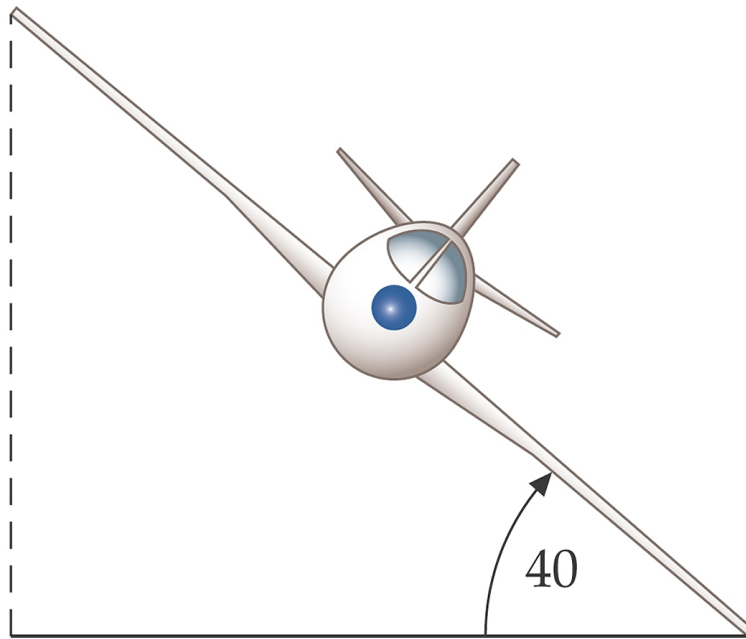


Figure 1: Exercise 4

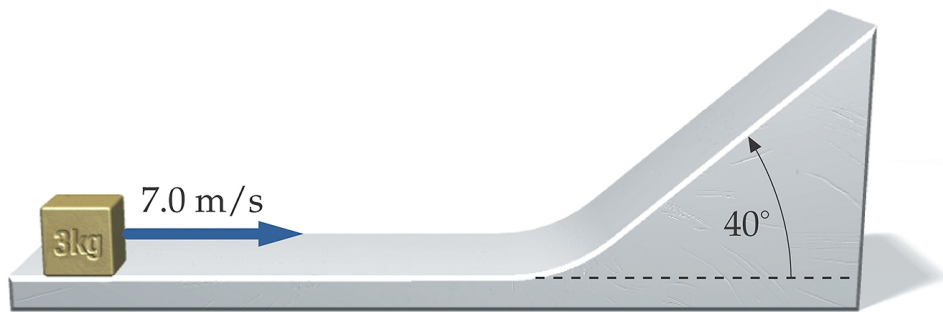


Figure 2: Exercise 6