

Physics 10
Exam Review Problems
Fall 2010

1. A car accelerates from 4.0 m/s to 16 m/s in 3.00 s. Find its acceleration and the distance it travels during the 3.00 s interval.
2. How far does a dropped rock fall during the first 2.5 s of free fall? How fast is it going after 2.5 s?
3. A ball rolls off the top of a 1.0 m tall table horizontally, and lands 2.5 m from the base of the table. How fast was the ball rolling?
4. Find the weight of a 5.00 kg rock. How much upward force is required to give the rock an upward acceleration of 4.00 m/s^2 ? How much upward force is required to keep the rock moving at a constant velocity of 4.00 m/s? How much upward force is required to accelerate the rock down at 4.00 m/s^2 ?
5. A horizontal push of 10 N gives a 2.0 kg block an acceleration of 2.0 m/s^2 . How much friction acts on the block? What acceleration would a push of 20 N produce? How much force is required to produce an acceleration of 4.0 m/s^2 ?
6. What is the momentum of a 4 kg cart traveling at 15 m/s? For how long would a 6.00 N force need to be applied to bring the cart to rest?
7. You hold a large (15 kg) box in place on an incline plane by a rope. Suppose that you release the box from rest and it slides down the incline at a constant velocity of 2.0 m/s. When the box reaches the bottom of the ramp, it slides on a flat surface and eventually slows to a stop after it travels 4.0 meters. (a) determine the frictional force on the box when on the flat surface (b) determine how long it takes the box to stop.
8. A 1200 kg car traveling at 20 m/s collides with a stationary 1800 kg van. The two vehicles stick together. What is their common speed after the collision?
9. A force of 30 N is applied to a 6.0 kg block of ice initially at rest on a frictionless horizontal surface. How far will the block travel before reaching a speed of 5.00 m/s? How much work is done on the block of ice?
10. A 50.0 kg pole vaulter running at 10.0 m/s vaults over the bar, If the vaulter's horizontal component of velocity over the bar is 2.0 m/s and the bar is 8.7 m high, how far away from the bar does the pole vaulter land?
11. Dr. Erickson drops a raw egg off the science building attempting to play a joke on an unsuspecting Dr. Schaeberle (162.5 cm tall) below. The egg hits Mrs. Picard in 1.2 seconds. Find the height of the science building and the velocity of the egg when it splatters on her head.
12. Suppose a box is pulled straight up with a force of 500 N and the mass of the box is 10 kg. The box is also pulled to the right with a force of 300 N. Determine the Net force on the box and show a vector diagram.
13. If distance is plotted as a function of time and the relationship is linear, what does that tell you about the velocity and the acceleration? Draw a velocity-time plot. If distance is plotted as a function of time and the relationship is quadratic, what does that tell you about the velocity and the acceleration? Draw the velocity time plot.

14. A particularly intelligent student attempts to jump out of the 3rd floor window of Clay (8.0 m) onto a mattress below. Knowing that he will run out of the window at a velocity of 3.5 m/s, determine where his friends should place the mattress (assuming they are good friends).
15. You are the captain of a small spaceship with a mass of 25 Mg in outer space. Your ship is at rest when you notice an alien craft approaching in a threatening manner. You decide to protect your ship by firing a 250 kg torpedo which travels at 275 m/s toward the enemy. How fast and in what direction is your ship moving after firing the torpedo?
16. A 102 g ball moving at 32 m/s west is struck by a racket and it bounces back east at a velocity of 35.0 m/s. If the impact time is 0.010 seconds, determine the force the racket exerts on the ball.
17. A 300 g lab cart rolling to the left collides with a 450 g cart rolling at 4.00 m/s to the right. Both carts stop as a result of the collision. Determine the initial velocity of the 300 g cart.
18. Using the proper physics terms, explain why adding padding and a parachute to a raw egg will help keep it intact when dropped off the Clay Centennial Science Center.
19. Sketch the position time, velocity time, and acceleration time graphs for the following scenario – you throw a ball straight up and catch it when it comes back down. It leaves your hand with an initial velocity of 20m/s upward.
20. A biker travels 3.0 miles east and then 2.0 miles north. What is her resultant displacement?
21. A 1800 kg car accelerates from rest under the action of two forces. One is a forward force of 5000 N from the traction of the cars tires and the road. The other is an opposing force of 850 N resulting from friction. How far the car must travel to reach a speed of 35 miles per hour? Use work-energy theorem.
22. Suppose you throw a ball up at an angle with a horizontal velocity component of 10 m/s and a vertical velocity component of 15 m/s. You can neglect air resistance in this problem. a) How long does it take the ball to get to its highest point? b) How long is the ball in the air? c) How high does the ball go? d) how far horizontally does the ball travel during the throw?
23. A motor boat crosses a 25 meter wide river with a current of 3.0 m/s and the motor boat's engine allows the boat to travel at a speed of 8.5 m/s. a) How long does it take the boat to cross the river? b) How far downstream does the boat land?
24. The royal antelope of western Africa has an average mass of only 3.2 kg. Suppose this antelope runs in a circle with a diameter of 60 m. If a force of 8.8 N maintains this circular motion, what is the antelope's tangential speed ? What is his acceleration? What work does the 8.8 N force do on the antelope?
25. If a fly makes 8 revolutions around your head in 12.0 seconds and moves at a tangential speed of 5.11 m/s, determine the radius of the fly's path?
26. A punter in a football game kicks a ball from the goal line at 60.0° from the horizontal with an initial velocity of 25.0 m/s. What is the hang time of the punt? How far down field does the ball land? What is the maximum height that the ball reaches?
27. A sled (mass = 15 kg) is pulled with a force of 50 N and accelerates from rest to 5 m/s while being pulled 20 meters. What is the net work on the sled? What work does the puller exert? What is the force of friction on the sled?