

Physics - Mock Spring Final!!!

Page 1 - Kinematics and Projectile Motion

1. A car going 25 m/s goes 13.4 m. What time does it take? (0.536 s)

2. A train can accelerate at 0.150 m/s/s. What time will it take to reach its top speed of 24.0 m/s from rest? (160 s)

3. A giant lizard stops in 5.85 m in 1.15 s. What was its acceleration? (-8.85 m/s/s)

4-6: A ball rolls off the edge of a 15.0 m tall cliff with a purely horizontal velocity, and strikes the ground at a distance of 12.4 m from the base of the cliff.

4. What time was the ball in the air? (1.75 s)

5. What was the ball's horizontal velocity? (7.09 m/s)

6. Draw a picture of the final velocity of impact. Calculate the speed it is traveling, and find the angle below horizontal the velocity makes.

(speed = 18.6 m/s, 67.5° below horiz.)

Page 2 - Forces

7. If there is a net force of 42.0 N on a 3.60 kg mass, what time would it cover 37.0 m from rest? (2.52 s)

8-9: A 1.60 kg mass hangs on a cord.

8. What does the tension need to be in the rope to accelerate the mass upwards at 3.56 m/s/s? (+21.4 N)

9. What is the acceleration of the mass if the tension in the rope is 19.3 N? (+2.26 m/s/s)

10. A 4.25 kg block of wood has a kinetic coefficient of friction of 0.120 and a static of 0.330 between it and the level floor. If the block is sliding to the right, and I exert a force of 7.80 N to the right, what is the acceleration of the block? (+0.659 m/s/s)

Page 3 - Work and Energy

11a. What speed must a 0.458 kg hammer go to have 60.0 J of kinetic energy? (16.2 m/s)

11b. What is the potential energy of a 2.60 kg clock weight that is 1.45 m above its lowest point?
(36.9 J)

12. How much time does it take for a 450. Watt heater to produce 4580 J of heat? What heat will it put out in 32.0 s? (10.2 s, 14,400 J)

13. A sled dog has a power output of 310. W. In what time can it drag a 112 kg sled 95.0 m across a frozen lake where the coefficient of friction is 0.130? (43.8 s)

14. Mom gives 55.0 kg Tamara a push from rest on her massless sled for a distance of 7.20 m at the top of a 3.80 m tall hill. If she is going 11.0 m/s at the bottom of the hill, what force did Mom exert at the top to speed her up? (Neglect friction) (178 N)

Page 4 - Impulse and Momentum, Circular Motion

15. A rocket engine burns 12.0 grams of fuel (0.0120 kg) in 1.10 seconds with an exhaust velocity of 782 m/s. What is the thrust of this engine? (8.53 N)

16. A bullet going 481 m/s imbeds in a stationary block of wood. The bullet and block combo are going 5.27 m/s after the collision, and the combo has a mass of 12.1 kg (Bullet and block). What was the mass of the bullet? (0.133 kg)

17. Two football players strike each other head on. Player 1 has a mass of 119 kg and is running 6.20 m/s to the East, and player 2 has a mass of 102 kg is running 4.20 m/s to the West. What is their post-collision velocity if they stick together? (Speed and direction) (1.40 m/s East)

18. How fast can your 800 Kg car go around a corner with a radius of 13 m when the available centripetal force is 6500 N? (10.3 m/s)

19. There is a force of gravity of 3.40×10^{-9} N between a 5.00 kg mass and a wrecking ball whose centers are separated by 2.50 m. What is the mass of the wrecking ball? (63.7 kg)

20. A Rock-O-Plane has a radius of 5.64 m and a period of 6.25 s. What "g" force do they read at the top and the bottom of the ride? (0.418 "g"s, 1.582 "g"s)