

Physics 11

Newton's Laws Practice Problems

1. A large crate has a mass of 200kg and the coefficient of friction between the box and the floor is 0.3. If you apply 400N will it move? What is the minimum force required to start the crate moving? (No, anything more than 588N)
2. What net force is required in order to give a projectile weighing 475 N an acceleration of 3000 m/s²? (1.45x10⁵N)
3. a) How much force is required to accelerate a 6.0 kg object from rest to 15 m/s in 9.0s? (10 N) b) How far does the object move while the force is acting on it? (67.5 m)
4. The coefficient of friction (μ) between a 5 kg wooden block and the floor is .234. a) What is the force of friction when you slide this block along the floor? (11.47N) b) What force is required to move the block with an acceleration of 2m/s² (22.47N)
5. A 45 kg sled is coasting with a constant velocity of 15 m/s over smooth ice. It enters a rough stretch of ice 3.2 m long in which the force of friction is 95 N. With what speed does the sled emerge from the rough stretch? (14.5 m/s)
6. It has been found (don't ask me how) that it requires about 2000 N in order to push a 1980 Dodge Diplomat along level ground at a constant velocity. If the Dodge has a mass of 2300 kg, what is the coefficient of friction? (.089)
7. A 60 kg sled is coasting with a constant velocity of 10 m/s over smooth ice. It enters a rough stretch of ice 6.0 m long in which the coefficient of friction is .204. A) What is the acceleration during this stretch? B) With what speed does it emerge from the rough patch (-2m/s², 8.7m/s)
8. The driver of an 800 kg sports car, heading directly for a railway crossing 200 m away, slams the brakes in a panic stop. The car is moving at 40 m/s, and the brakes can supply a stopping force of 2500 N. a) How fast will the car be moving when it reaches the crossing? (18.7 m/s) b) What is the coefficient of friction?
9. A golf ball, mass 60g, is struck by a golf club and acquires a speed of 80 m/s during the impact, which lasts for 2x10⁻⁴ s, what is the force exerted on the ball? (2.4x10⁴ N)
10. A vertical rope is attached to a 27 kg box. What tension (force) in the rope is needed to cause the box to acquire an upward acceleration of 7.5 m/s²? (466 N)
11. A boy weighing 800.0 N wishes to reach ground from a treetop by sliding down a rope. The maximum upward force the rope can exert without breaking is 325.0 N. (a) Can the boy slide down the rope at a constant speed? (b) What is the least acceleration with which the boy can slide down the rope? (NO, 5.82 m/s²)
12. An elevator of mass 1000 kg is supported by a cable that can sustain a force of 12500 N. If a man that has a mass of 115 kg is in the elevator, what is the greatest upward acceleration that can be given to the elevator without breaking the cable? (1.4 m/s²)
13. A falling ball has a mass of 2.0 kg, and the upward force of air resistance is 11.6 N, what is the acceleration of the ball? (4.1 m/s²)
14. A 1250 kg car is traveling at 35 m/s and collides with a heavy truck. The car moves 4.8 m forward while it is being brought to rest. What force is exerted on the car by the truck? (1.6x10⁵ N)
15. An empty truck, with a mass of 2500 kg, has a maximum acceleration of 4.0 m/s². What is the maximum acceleration when it is carrying a 1500 kg load? (2.5m/s²)

16. a) A 1250kg elevator has an upward acceleration of 2.5 m/s^2 . What is the tension in its supporting cable? (15375 N) b) A 1250kg elevator has a downward acceleration of 2.5 m/s^2 . What is the tension in its supporting cable? (9125 N)
17. An elevator with mass 1000 kg is supported by a cable which can sustain a force of 12000 N. What is the greatest upward acceleration that can be given to the elevator without breaking the cable? (2.2 m/s^2)
18. A 1500 kg car collides with a heavy truck. The car, which was initially going 20 m/s moves 3.0 m forward while it is being brought to rest. What force is exerted on the car by the truck? (100 000 N)
19. A boy, weighing 800 N wishes to reach ground from a treetop by sliding down a rope. The maximum upward force that the rope can exert is 425 N. A) Can the boy slide down the rope at a constant speed? B) what is the minimum acceleration that the boy can slide down the rope with in order to avoid breaking it? (no, -4.6 m/s^2)
20. A 75kg skydiver in free fall acquires a velocity of 60 m/s and then opens his parachute. After 3s his velocity has been reduced to 8.0 m/s. a) what was the acceleration (actually a deceleration) of the skydiver while his chute was opening? b) What is the force exerted by the parachute during this time? (17.3 m/s^2 , 2033 N)
21. A train is hauling 3 boxcars. Each car has a mass of 8000kg and the train itself has a mass of 12000kg. If the coefficient of friction is 0.1 determine the force felt by each hitch and the force of the rail tracks on the train's wheels, if the acceleration is 1.5 m/s^2 ? (19840N, 39680N, 59520N, 89280N)