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UNIT 10 PRACTICE PROBLEMS PHYSICS 1

10.1 WORK

1. Together, two students exert a force of 825 N in pushing a car a distance of 35 m.
    a. How much work do the students do on the car?
    b. If the force was doubled, how much work would they do pushing the car the same distance?
2. During a tug-of-war, team A does 2.20105 J of work in pulling team B 8.00 m. What force was team A exerting?
3. A rock climber wears a 7.5-kg backpack while scaling a cliff. After 30.0 min, the climber is 8.2 m above the starting point.
    a. How much work does the climber do on the backpack?
    b. If the climber weighs 645 N, how much work does she do lifting herself and the backpack?
4. A rope is used to pull a metal box a distance of 15.0 m across the floor. The rope is held at an angle of 46.0° with the floor, and a force of 628 N is applied to the rope. How much work does the force on the rope do?
5. A wagon is pulled by a force of 38.0 N exerted on the handle at an angle of 42.0° with the horizontal. If the wagon is pulled in a circle of radius 25.0 m, how much work is done?
6. Lawn Mower Shani is pushing a lawn mower with a force of 88.0 N along a handle that makes an angle of 41.0° with the horizontal. How much work is done by Shani in moving the lawn mower 1.2 km to mow the yard
7. The graph in **Figure 10-22** shows the force and displacement of an object being pulled. Calculate the work done to pull the object 7.0 m.

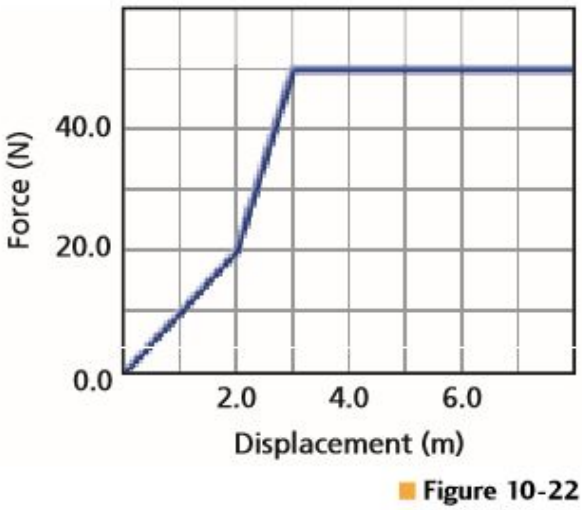

Figure 10-22

8. John pushes a crate across the floor of a factory with a horizontal force. The roughness of the floor changes, and John must exert a force of 20 N for 5 m, then 35 N for 12 m, and then 10 N for 8 m.
    a. Draw a graph of force as a function of distance.
    b. Find the work John does pushing the crate.

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UNIT 10 PRACTICE PROBLEMS PHYSICS 1

10.2 KINETIC ENERGY AND THE WORK-ENERGY THEOREM

9. A 1600-kg car travels at a speed of 12.5 m/s. What is its kinetic energy?
10. A racing car has a mass of 1525 kg. What is its kinetic energy if it has a speed of 108 km/h?
11. Shawn and his bike have a combined mass of 45.0 kg. Shawn rides his bike 1.80 km in 10.0 min at a constant velocity. What is Shawn's kinetic energy?
12. In the 1950s, an experimental train, which had a mass of 2.50×10^4 kg, was powered across a level track by a jet engine that produced a thrust of 5.00×10^5 N for a distance of 509 m.
    a. Find the work done on the train.
    b. Find the change in kinetic energy.
    c. Find the final kinetic energy of the train if it started from rest.
    d. Find the final speed of the train if there had been no friction.
13. A 14,700-N car is traveling at 25 m/s. The brakes are applied suddenly, and the car slides to a stop. The average braking force between the tires and the road is 7100 N. How far will the car slide once the brakes are applied?
14. A 15.0-kg cart is moving with a velocity of 7.50 m/s down a level hallway. A constant force of 10.0 N acts on the cart, and its velocity becomes 3.20 m/s.
    a. What is the change in kinetic energy of the cart?
    b. How much work was done on the cart?
    c. How far did the cart move while the force acted?
15. A comet with a mass of 7.85×10^{11} kg strikes Earth at a speed of 25.0 km/s. Find the kinetic energy of the comet in joules, and compare the work that is done by Earth in stopping the comet to the 4.2×10^{15} J of energy that was released by the largest nuclear weapon ever built.

10.3 POWER

16. A force of 300.0 N is used to push a 145-kg mass 30.0 m horizontally in 3.00 s. a. Calculate the work done on the mass. b. Calculate the power developed.
17. A cyclist exerts a force of 15.0 N as he rides a bike 251 m in 30.0 s. How much power does the cyclist develop?
18. A lawn roller is pushed across a lawn by a force of 115 N along the direction of the handle, which is 22.5° above the horizontal. If 64.6 W of power is developed for 90.0 s, what distance is the roller pushed?
19. An engine moves a boat through the water at a constant speed of 15 m/s. The engine must exert a force of 6.0 kN to balance the force that the water exerts against the hull. What power does the engine develop?
20. A 120-kg lawn tractor, shown in **Figure 10-17**, goes up a 21° incline that is 12.0 m long in 2.5 s. Calculate the power that is developed by the tractor.

Figure 10-17

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