

Total time: 1 hr Total Points: 10 pt**Student Name:**

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page.

$$\text{speed} = \frac{\text{distance}}{\text{time}} \quad \text{velocity} = \frac{\text{displacement}}{\text{time}} \quad \text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$\text{velocity} = \text{initial velocity} + \text{acceleration} \times \text{time}$$

$$g = 9.8 \text{ m/s}^2 \quad F = ma \quad F_g = mg \quad F_{fr} = \mu F_N \quad \text{Torque} = \text{Force} \times \text{Lever Arm}$$

$$\text{momentum} = mv \quad \text{change in momentum} = \text{impulse} = (\text{force})(\text{time})$$

$$\text{work} = (\text{force})(\text{distance}) \quad \text{power} = \frac{\text{work}}{\text{time}} \quad \text{K.E.} = \frac{1}{2}mv^2 \quad \text{P.E.} = mgh$$

1. Find the momentum of a heavy automobile of mass 2630 kg traveling 21.0 m/s.
2. What force is required to stop a 1350-kg car traveling 95.0 km/h within 4.0 s?
3. What force is required to slow a 1350-kg car traveling 95.0 km/h to 25.0 km/h within 3.0 s?
4. A bullet with mass 60.0 g is fired with an initial velocity of 575 m/s from a gun with mass 4.50 kg. What is the speed of the recoil of the gun?
5. A railroad car of mass 2.00×10^4 kg is traveling north 6.00 m/s and collides with a railroad car of mass 1.50×10^4 kg traveling south 4.00 m/s. Find the velocity of the railroad cars that become coupled after the collision.
6. One ball of mass 0.500 kg traveling 6.00 m/s to the right collides with a ball of mass 0.200 kg initially at rest. After the collisions, the heavier ball is traveling 2.57 m/s to the right. What is the velocity of the lighter ball after the collision?
7. How much work is required for a mechanical hoist to lift a 9000-N automobile to a height of 1.80 m for repairs?
8. The work required to lift eleven 94.0-lb bags of cement from the ground to the back of a truck is 4340 ft.lb. What is the distance from the ground to the bed of the truck?
9. How much work is done lifting a 200-kg wrecking ball 6.50 m above the ground?
10. What is 2,000 W in horsepower?
11. What is the rating in kW of a 2.00-hp motor?
12. What is 2.5 BTU in Joules?
13. What is 4.186 kJ in BTU?
14. What is 10.0 kJ in ft.lb?

15. An engine supplies 132 J of energy in 7.00 s. What is its power?
16. A 231 ft lb/s motor runs for 14.3 s. How much energy in ft.lb does it deliver?
17. How much energy can a 5.0-kW motor deliver in 10 minutes?
18. A pump is needed to lift 750 mL (mass 0.750 kg) of water every minute a vertical distance of 25.0 m. What power in W must the pump be able to deliver?
19. A 50-kg welder is to be raised 15.0 m above the ground by a motor. How much work did the motor do in the process?
20. If the motor from the previous example lifted the 50-kg welder 15.0 m above the ground in 12.0 s, how much is its power?
21. A bullet with mass 12.0 g travels 415 m/s. Find its kinetic energy?
22. A 1,500-kg car is moving at 25.0 m/s. What is its kinetic energy?
23. A 475-kg pressed concrete beam is to be raised 10.0 m above the ground. How much is its potential energy at the top?