NOTE: Below are some sample problems. You need to understand the material covered, examples in the text and assigned homework problems, recitation problems etc.

---

1) A 1.0-kg ball moving at 2.0 m/s perpendicular to a wall rebounds from the wall at 1.5 m/s. The change in the momentum of the ball is:
(a) zero
(b) 0.5 N.s away from wall
(c) 0.5 N.s toward wall
(d) 3.5 N.s away from wall
(e) 3.5 N.s toward wall

2) Two 500g blocks of wood are 2.0 m apart on a frictionless table. A 10g bullet is fired at 400 m/s toward the blocks. It passes all the way through the first block, and then embeds itself in the second block. The speed of the first block immediately afterward is 6.0 m/s. What is the speed of the second block after the bullet stops in it?

3) A ball of mass 0.220 kg that is moving with a speed of 7.5 m/s collides head-on and elastically with another ball initially at rest. Immediately after the collision, the incoming ball bounces backward with a speed of 3.8 m/s. Calculate –
(*a*) the velocity of the target ball after the collision
(*b*) the mass of the target ball.

4) A truck, initially at rest, rolls down a frictionless hill of height ***h*** and reaches a speed ***v*** at the bottom. To achieve a speed of ***2v*** at the bottom, how high must the hill be?

(a) h/2 (b) h (c) $\sqrt{2}\,h$ (d) 2h (e) 4h

5) James Bond, who "weighs" 75 kg, jumps off with zero initial speed from the top of a dam with a bungee cord tied to his ankle. The total drop is 220 m. At some time during the jump, the bungee cord starts stretching. Bond reaches the bottom with an instantaneous speed of zero. What is the elastic potential energy stored in the bungee cord at the instant he reaches bottom?

6) A 10g bullet is fired into a 1200g wood block hanging from a 150-cm long string. The bullet embeds itself into the block and the block swings out to an angle of 40^0. What is the speed of the bullet?

7) Two vectors with magnitudes *A* and *B* have a dot product *AB*/2. The angle between the two vectors is:

(a) 0° (b) 30° (c) 45° (d) 60° (e) 90°

8) A force, ***F*** acts on a small object of mass 95g. If the displacement of the object is ***d***, find the work done by the force. What is the angle between ***F*** and ***d*** ? Given:

$$\vec{\mathbf{F}} = \left(10.0\hat{\mathbf{i}} + 9.0\hat{\mathbf{j}} + 12.0\hat{\mathbf{k}}\right)\text{kN} \qquad \vec{\mathbf{d}} = \left(5.0\hat{\mathbf{i}} + 4.0\hat{\mathbf{j}}\right)\text{m}$$

9) The velocity of a particle moving along the x-axis changes from v_1 to v_2. For which of the following values of v_1 and v_2 is the total work done on the particle negative? [Hint: Use the work-kinetic energy theorem.]

(a) $v_1 = +3, v_2 = +7$
(b) $v_1 = -3, v_2 = +7$
(c) $v_1 = -3, v_2 = -7$
(d) $v_1 = +3, v_2 = -7$
(e) $v_1 = -7, v_2 = +3$

10) A block is seen to slide down a rough ramp at *constant speed.*
(a) What forces act on the block as it slides (indicate these in a diagram)?
(b) Which of these forces do work on the block?
(c) What is the net work done by all forces on the block as it slides from the top of the ramp to the bottom of the ramp?

11) A 46.0-kg crate, starting from rest, is pulled across a floor with a constant horizontal force of 225 N. For the first 11.0 m the floor is frictionless, and for the next 10.0 m the coefficient of friction is 0.20. What is the final speed of the crate after being pulled these 21.0 m?

12) A 1400-kg sports car accelerates from rest to 95 km/h in 7.4 s. What is the average power delivered by the engine?