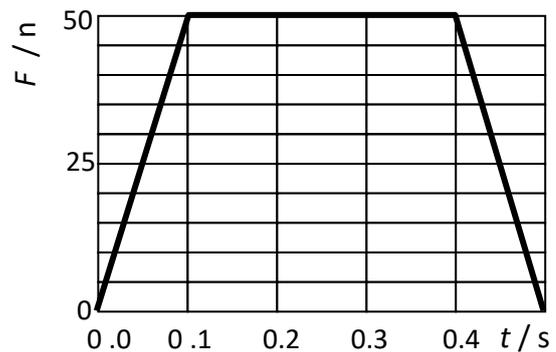


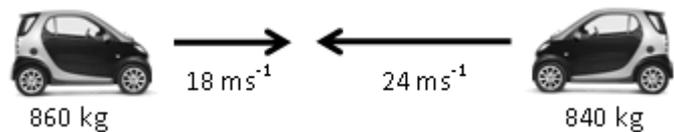
*THIS IS A PRACTICE ASSESSMENT. Show formulas, substitutions, answers (in spaces provided) and units!*

A 1.5-kg mass is traveling to the left at  $6.0 \text{ ms}^{-1}$ . It then experiences an impulse represented in the  $F$  vs.  $t$  graph shown here.



1. What is the total impulse given to the ball?  
1. \_\_\_\_\_
2. What is the change in momentum of the ball?  
2. \_\_\_\_\_
3. What is the final velocity of the ball?  
3. \_\_\_\_\_

Two Smart Cars are on a collision course, as shown.



4. What is the total initial momentum of the two cars?  
4. \_\_\_\_\_
5. The two cars collide and stick together. What is their velocity immediately after the collision?  
5. \_\_\_\_\_
6. What is the change in kinetic energy of the two-car system?  
6. \_\_\_\_\_
7. Explain and justify whether or not the ball undergoes an elastic collision.  
\_\_\_\_\_

A 6.25-gram bullet traveling at  $365 \text{ ms}^{-1}$  strikes and enters a 4.50-kg crate. The crate slides 0.15 m along a wood floor until it comes to rest.



8. What is the speed of the crate/bullet system immediately after the collision?  
8. \_\_\_\_\_
9. What is the change in kinetic energy of the system after the collision.  
9. \_\_\_\_\_
10. Find the friction force between the crate and the floor.  
10. \_\_\_\_\_

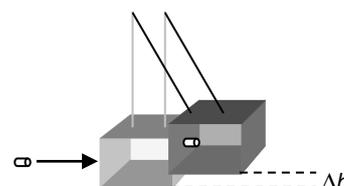
11. What is the coefficient of dynamic friction between the crate and the floor?

11. \_\_\_\_\_

12. What is the average force applied by the crate on the bullet *during* collision if the bullet penetrates the 1.10 cm into the crate?

12. \_\_\_\_\_

A ballistic pendulum consists of a 1.25-kg block of wood that is hanging from the ceiling in such a way that when a bullet enters it, the block's change in height can be recorded as it swings. A bullet having a mass of 6.25-grams and unknown velocity strikes the block and becomes imbedded in it. The impulse imparted to the block causes it to swing in such a way that its height increases by 7.15 cm.



13. What was the change in potential energy of the block/bullet combo after the collision?

13. \_\_\_\_\_

14. What was the speed of the block/bullet combo *immediately* after the collision (and before it began to swing)?

14. \_\_\_\_\_

15. What was the speed of the bullet before entering the block of wood?

15. \_\_\_\_\_

A rocket engine uses fuel and oxidizer in a reaction that produces gas particles having a velocity of  $1380 \text{ ms}^{-1}$ . The desired thrust is to be 195000 N.

16. What must be the fuel/oxidizer consumption rate (in  $\text{kg s}^{-1}$ )?

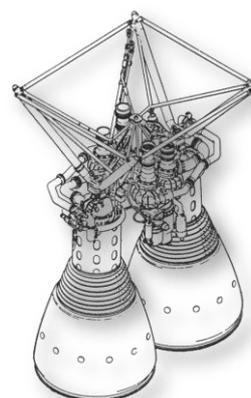
16. \_\_\_\_\_

17. If the initial weight of the rocket is 125000 N, what is its initial acceleration?

17. \_\_\_\_\_

18. What are the weight and acceleration of the rocket at  $t = 15.0 \text{ s}$  after ignition?

18. \_\_\_\_\_



19. What are the weight and acceleration of the rocket at  $t = 20.0 \text{ s}$  after ignition?

19. \_\_\_\_\_