

# AP Physics Test Review

Name \_\_\_\_\_

## INVESTIGATIONS 8-9: Friction and Linear Momentum

For questions 1-6, write the letter corresponding to the best answer in the blank to the left of each question.

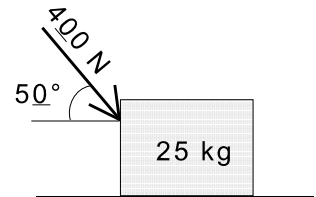
- \_\_\_\_\_ 1. A moving freight car runs into a car of the same mass at rest on the track. The cars couple together. Compared to the original velocity of the first car before the collision, the velocity of the combined cars after the collision is...
- A) zero.
  - B) one-half as great.
  - C) one-third as great.
  - D) one-fourth as great.
- \_\_\_\_\_ 2. A cannon, initially at rest, is fired. After the shot, the combined momentum of the cannon and cannonball system...
- A) is larger than it was before the shot.
  - B) is smaller than it was before the shot.
  - C) is still zero, like it was before the shot.
  - D) is not zero, but it is the same as before the shot.
- \_\_\_\_\_ 3. A block is dragged at a constant speed across a level surface by a force of 4 N. What is the frictional force between the block and the surface?
- A) less than 4 N
  - B) more than 4 N
  - C) 4 N
- \_\_\_\_\_ 4. Friction **coefficients** for objects sliding across solid surfaces are **NOT** affected by which of the following?
- A) texture of the underlying surface
  - B) a moving object's surface texture
  - C) normal force
  - D) whether the object is moving or not
- \_\_\_\_\_ 5. Which statement about normal force is **NOT** true?
- A) It is equal in size to the total weight of an object when the object is on a horizontal surface.
  - B) It acts downward toward the center of the earth when an object is on a horizontal surface.
  - C) It is a force pressing surfaces together.
  - D) It is always perpendicular or "normal" to a surface.
- \_\_\_\_\_ 6. The normal force for an object on a slope is...
- A) greater than the weight of the object.
  - B) equal to the weight of the object.
  - C) equal to the part of the object's weight parallel to the surface.
  - D) equal to the part of the object's weight perpendicular to the surface.

**LINEAR MOMENTUM**

7. A 65 kg ice skater traveling at 6.0 m/s runs head-on into an 85 kg skater traveling straight forward at 4.5 m/s. At what speed and in which direction do the ice skaters travel if they move together after the collision?
8. A 4.0 kg object traveling westward at 25 m/s hits a 15 kg object at rest. The 4.0 kg object bounces eastward at 8.0 m/s. What is the speed and direction of the 15 kg object?
9. A bullet of mass 0.65 kg is fired from a 4.0 kg gun with a speed of 500 m/s. What is the recoil speed of the gun?

**FRICTION OVER A LEVEL SURFACE WITH ANGLED APPLIED FORCES**

10. A 150 N crate is dragged across a floor by pulling on a rope inclined 15.0° above the horizontal.
  - a. If the tension in the rope is 20.0 N just when the crate begins to move, what is  $\mu_s$ ?
  - b. If the tension is increased to 50.0 N and the  $\mu_k$  is 0.100, how much will the crate accelerate?
11. As shown in the figure at right, a 400 N force pushes at a 50° angle on a 25 kg box. Starting from rest, the box achieves a velocity of 2.0 m/s in 4.0 s. Find the coefficient of kinetic friction between the box and the floor.



**FRICTION ON INCLINED PLANES**

12. Mr. M finds that he just begins to slide down a ski slope when the slope makes an angle of 25° with the horizontal. What is the coefficient of **static** friction between the snow and the skis?
13. A child slid down a slide angled at 40.0° to the horizontal. If the child weighed 350 N and accelerated down the slide at 2.00 m/s<sup>2</sup>, what was the kinetic coefficient of friction between the child and the slide?
14. A block weighing 80.0 N rests on a plane inclined at 20.0° to the horizontal. The  $\mu_s=0.250$ , while  $\mu_k=0.150$ .
  - a) What is the minimum force **F**, parallel to the plane, that will prevent the block from slipping?
  - b) What is the minimum force **F** that will start the block moving up the plane?
  - c) What force **F** is then required to move the block up the plane at a constant velocity?

**Answers :**

1)	B	
2)	C	
3)	C	
4)	C	
5)	B	
6)	D	
7)	0.050 m/s toward 65 kg skater	
8)	8.8 m/s west	
9)	81 m/s	
10)	a) 0.133	b) 2.26 m/s <sup>2</sup>
11)	0.44	
12)	0.47	
13)	0.573	
14)	a) 8.57 N up the slope	b) > 46.2 N up the slope
	c) 38.6 N up the slope	