Name _____ Period _____ Date _____

Friction and Pressure

Pre-Test - Post-Test

1. Pressure is defined as _____.

A) force through distance.
B) change in height per time.
C) force per area.
D) force per time.
E) energy per area.

2. Which of the following would exert the most pressure on the ground?

A) standing in high heel shoes.
B) standing in running shoes.
C) standing on skis.
D) standing on snow shoes.

3. Friction is a force that always acts _____.

A) perpendicular to the object's motion.
B) in the same direction as the object's motion.
C) opposite to the object's motion.

4. Suppose the force of friction on a sliding object is 10 N. The force needed to maintain a constant velocity is _____.

A) 10 N.
B) more than 10 N.
C) less than 10 N.

5. Putting wider tires on a car will _____.

A) increase the traction with the road.
B) decrease the traction with the road.
C) not change the traction with the road.
D) ...more information is needed.

6. When an object falls through the air and when friction is a factor, as the object's velocity increase the object's acceleration _____.

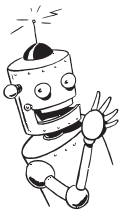
A) increases.
B) decreases.
C) stays constant.

7. Which encounters the greater force of air resistance... a falling elephant or a falling feather?

A) The elephant.
B) The feather.
C) The same force on both.

8. A heavy person and a light person parachute together and wear the same size parachutes. Assuming they open their parachutes at the same time, which person reaches the ground first?

A) the light person.
B) the heavy person.
C) they both reach the ground together.

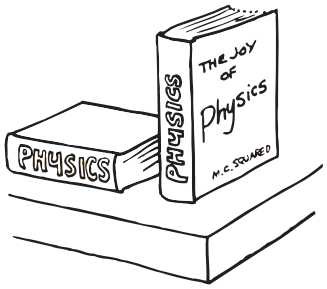


Name _____ Period _____ Date _____

Friction and Pressure

Applying Force—Pressure

1. A book is placed on a table top. In which position will the book apply the largest force to the table top?



2. In which position will the book apply the greatest pressure to the table top?

3. When you stand on a bathroom scale and then lift one foot will this change the reading on the scale?

4. What is pressure?

5. What is the formula for pressure?

6. Is it possible for a woman in heels to exert more pressure on the ground than an elephant? Explain

7. Two spheres of different sizes are placed in your hands and weighed by comparing. Why is this not a good method for determining which spheres weighs more? Explain

Friction

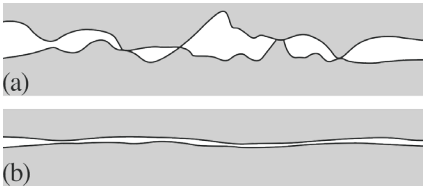
8. What is friction?

9. List the two types of surface friction?

10. Describe the difference between static and sliding friction.

11. What is the formula used to calculate surface friction?

12. What is the cause of friction?

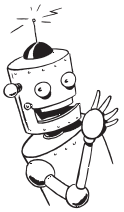


13. How can you decrease surface friction?

14. Is surface friction affected by the speed of an object?

15. What is the purpose of anti-lock brakes on a car?

16. Explain how does pressure affect the amount of friction acting on an object?



17. Do wider tires provide more traction with the ground than narrower tires?

18. What is the advantage of wider tires?

Air Resistance

19. A "shooting star" is usually a small grain of sand that burns up and gives off light as it enters the atmosphere. What causes this burning?

20. Does air resistance on a falling object increase or decrease with increasing speed?

21. List the main factors that determine the force of air resistance acting on a falling object.

22. As an object falls faster and faster through the air, where air resistance is a factor, does its acceleration increase, decrease, or remain constant?

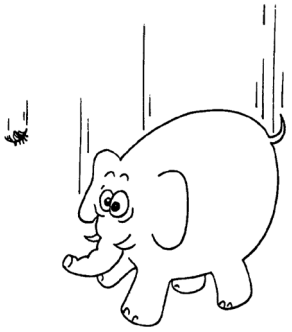
23. What is terminal velocity?

24. What is the acceleration of a falling object that has reached its terminal velocity?

25. How does the weight of a falling body compare with the air resistance it encounters just as it reaches terminal velocity?

The Feather and the Elephant

26. A feather and an elephant are dropped together at the same time.

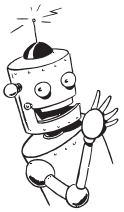


a) If the feather weighs 0.01 N, what is the force of air resistance when the feather reaches terminal velocity?

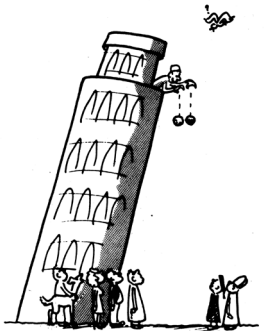
b) If an elephant weighs 20,000 N, what is the force of air resistance when the elephant reaches terminal velocity?

c) Which encounters the greater force of air resistance... a falling elephant or a falling feather?

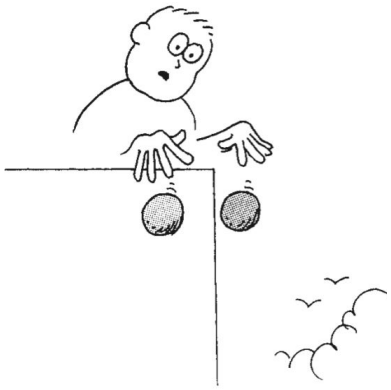
d) Explain why a feather begins to float as soon as it is released but the elephant continues to accelerate for a longer period.



27. When Galileo dropped two balls from the top of the Leaning Tower of Pisa, air resistance was not really negligible. Assuming both balls were the same size but one was much heavier than the other, which ball struck the ground first? Explain



28. If you simultaneously drop a pair of tennis balls from the top of a building, they will strike the ground at the same time.

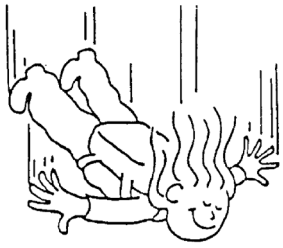


a) If one of the tennis balls is filled with lead pellets, will it fall faster and hit the ground first?

b) Which of the two tennis balls will encounter more air resistance? Defend your answers.

The Parachutist

29. A sky diver falls faster and faster through the air.



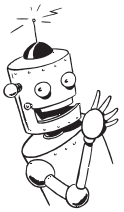
a) As she falls faster and faster, does her acceleration increase, decrease, or remain unchanged?

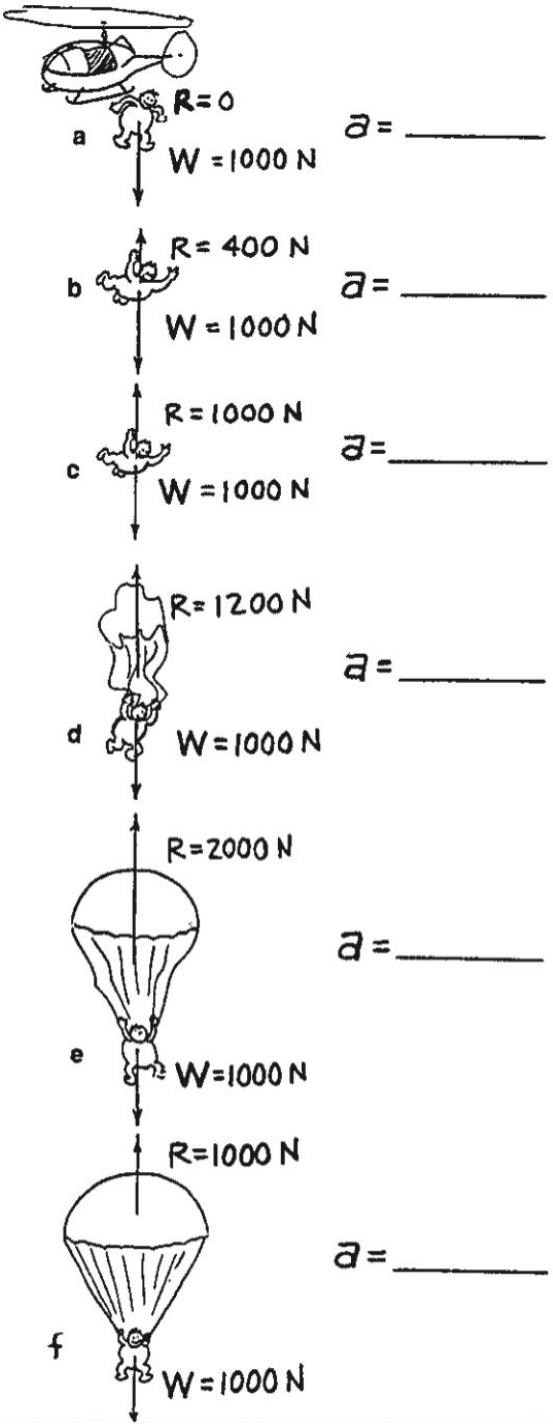
b) Before reaching terminal velocity, does the net force on her increase, decrease, or remain unchanged?

c) If the parachutist weighs 300 N, what is the force of air resistance at terminal velocity?

d) What happens to the direction of motion of a falling parachutist when they pull the cord opening the chute?

e) What is the direction of her acceleration as soon as she opens her chute?





30. Tim (100-kg) skydives and parachutes from a stationary helicopter. Various stages of fall are shown in positions a-f. Using Newton's second law find Tim's acceleration at each position.

a) In which position(s) does Tim experience a downward acceleration?

(a) (b) (c) (d) (e) (f)

b) In which position(s) does Tim experience an upward acceleration?

(a) (b) (c) (d) (e) (f)

c) In which position(s) is Tim's velocity decreasing?

(a) (b) (c) (d) (e) (f)

d) In which position(s) is Tim's velocity constant?

(a) (b) (c) (d) (e) (f)

e) In which position(s) is Tim's terminal velocity greatest?

(a) (b) (c) (d) (e) (f)

f) If Tim were heavier, his terminal velocity would be greater, lesser, or the same?