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## Ch 5 Newton's 2nd Law Questions

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Yellow ?'s :

p. 63 1. If a car can accelerate at  $2 \text{ m/s}^2$ , what acceleration can it attain if it is towing another car of equal mass?

2. What kind of motion does a constant force produce on an object of fixed mass?

p. 64 1. Two forces act on a book resting on a table: its weight and the normal force from the table. Does a force of friction act as well?

2. Suppose a high-flying jet cruises with a constant velocity when the thrust from its engines is a constant  $80,000 \text{ N}$ .

a. What is the acceleration on the jet?

b. What is the force of air resistance acting on the jet?

c. Draw a free-body diagram

p. 66 1. In attempting to do the demonstration shown in Figure 5.8, would it be wise to begin with a few nails and work upwards to more nails?

2. The massiveness of the cement block plays an important role in this demonstration. Which provides more safety, a less massive block or a more massive one? Hint: consider amount of surface contact of nails on the body

2

**Chapter Assessment: pp 71-73    Review Questions:**

1. Distinguish between the relationship that defines acceleration (formula for acceleration) and the relationship that states how it is produced (newton's 2nd law). (5.1)

2. What is meant by the net force that acts on an object? (5.1) Hint: check vocab from ch 3

3. Suppose a cart is being moved by a certain net force. If the net force is doubled, by how much does the cart's acceleration change? (5.1)

4. Suppose a cart is being moved by a certain net force. If a load is dumped into the cart so its mass is doubled, by how much does the acceleration change? (5.2) Hint: mass is doubled. Hint: use 2nd law formula

5. Distinguish between the concepts directly proportional and inversely proportional. **Support your statement with examples.** (5.1-5.2)

6. State Newton's second law in words and then in the form of an equation. (5.3)

3

7. How much force does a 20,000 kg rocket develop to accelerate  $1 \text{ m/s}^2$ ? (5.3)  $a = \frac{F}{m}$   
given:

8. What is the cause of friction, and in what direction does it act with respect to the motion of a sliding object? (5.4)

9. a. If the force of friction acting on a sliding crate is 100N, how much force must be applied to maintain a constant velocity?

b. What will be the net force acting on the crate?

c. What will be the acceleration? (5.4)

d. Draw a free-body diagram

10. Distinguish between force and pressure. (5.5) (use their definitions)

11. Which produces more pressure on the ground, a person standing up or the same person lying down? (5.5) Hint: consider the area of contact touching the floor 4

$$P = \frac{F}{A}$$

**Plug and Chug: Show given, formula, formula with data, answer boxed (units)**

use Newton's 2nd Law formula to solve  $a = \frac{F_{net}}{m}$  Hint:  $F_{net}$  is the resultant sum of all forces acting on object

19. Calculate the acceleration of a 200 kg single-engine airplane just before takeoff when the thrust of its engine is 500N.

20. Calculate the acceleration of a 300,000 kg jumbo jet just before takeoff when the thrust for each of its four engines is 30,000 N.

$F_{net} =$

21. a. Calculate the acceleration if you push with a 20 N horizontal force on a 2 kg block on a horizontal friction-free air table. (no  $F_f$ )

b. What acceleration occurs if the friction force is 4 N?

**Think and Explain**

5

24. What is the difference between saying that one quantity is proportional to another and saying it is equal to another?

25. If an object has no acceleration, can you conclude that no forces are exerted on it? Explain and draw a free-body diagram to illustrate an example.

28. If you push horizontally on your book with a force of 1 N to make the book slide at constant velocity, how much is the force of friction on the book? Draw a free-body diagram.

29. When blocking in football, why does a defending lineman often attempt to get his body under that of his opponent and push upward? (Hint: think about the area of contact between the opponents feet and the ground)

$$P = \frac{F}{A}$$

30. Why does a sharp knife cut better than a dull knife? Hint: consider surface area

$$P = \frac{F}{A}$$

**Think and Solve****6**

use Newton's 2nd Law formula to solve  $a = \frac{F_{\text{net}}}{m}$  Hint:  $F_{\text{net}}$  is the resultant sum of all forces acting on object

35. If a 1N net force accelerates a 1 kg mass at  $1 \text{ m/s}^2$ , what is the acceleration caused by a net force of 2N on a 2 kg mass?  
Hint: doubled both force and mass

36. What is the acceleration of a 747 jumbo jet, mass 30,000 kg, in a takeoff when the thrust (force) for each of its four engines is 30,000 N? (given, formula, formula w/ data, answer boxed)

37. A certain force applied to a 2 kg mass accelerates the mass at  $3 \text{ m/s}^2$ . How much acceleration will the same force produce on a 4 kg mass?  
Hint: doubled mass therefore how does this effect acceleration?

38. A horizontal force of 100N is required to push a crate across a factory floor at a constant velocity. a. What is the net force acting on the crate?

b. What is the force of friction acting on the crate?