

Ch 2 *Conceptual Physics*-11th edition Answers by R. E. Tremblay
pg. 30 Review Questions

9. Cite Newton's 1st law of motion.

Ans. An object at rest will remain at rest. An object in motion will remain in motion at a constant velocity, unless an unbalanced force is applied to it.

10. What is the net force on a cart that is pulled to the right with 100 pounds of force and to the left with 30 pounds of force?

Ans. 70 pounds to the right.

11. Why do we say that force is a vector quantity?

Ans. To know the complete value of a force we must know its magnitude and direction. Anything that has both magnitude and direction is given the name *vector*.

14. What is the net force on a bag pulled down by gravity with 18 newtons and pulled upward by a rope with a force of 18 newtons.

Ans. 0 newtons.

15. What does it mean to say that something is in mechanical equilibrium?

Ans. When an object is in mechanical equilibrium, the sum of all the forces on it are zero and it therefore cannot accelerate.

17. Consider a book that weighs 15 newtons at rest on a flat table. a) How many newtons of support force does the table provide? b) What is the net force on the book in this case?

Ans. a) Because the net force is 0 and we are told that the book is pushing down on the table with a force of 15 newtons, we must conclude that the table is pushing up on the book with a force of 15 newtons.

b) Because the book is at rest on the table, those of us that believe in Newton's 1st law of motion know that the net force on the book must be zero.

20. What is the test for whether a moving object is in equilibrium?

Ans. If an object is not accelerating, then it is in equilibrium.

Ch. 2 Pg. 32-33 Exercises; Conceptual Physics-11th edition

1. A ball rolling along floor doesn't continue rolling indefinitely. Is it because it is seeking a place of rest or because some force is acting upon it? If the latter, please identify the force.

Ans. Aristotle would say that the rolling ball stopped because a force was not acting on it to keep it going. He would be wrong. Galileo would say that an unbalanced force must have acted upon the ball to stop it. That force is called friction, and it is in the opposite direction than the ball was rolling.

14. In terms of Newton's first law, how does a car head rest help to guard against whiplash in a rear-end collision?

Ask in class.

20. Consider a pair of forces, one having a magnitude of 20 N and the other 12 N. What maximum net force is possible for these two forces? What is the minimum?

Ans. Maximum will occur if the forces are applied in the same direction. 32 newtons.

Minimum will occur if the forces are applied in opposite directions to each other. 8 newtons

21. When any object is in mechanical equilibrium, what can be correctly said about all the forces that act on it? Must the net force necessarily be zero?

Ans. The sum of all the forces acting on the object must be zero. The net force is zero.

24. When a ball is tossed straight up, it momentarily comes to a stop at the top of its path. Is it in equilibrium during this brief moment? Why or Why not?

Ans. Although the ball stops moving at the top of its flight, it is always accelerating down. Therefore, it is not in equilibrium at any point. Not even at the instant at the top of its flight that it stops.

26 Can you say that no force acts on a body at rest? Or is it correct to say that no net force acts on it? Defend your answer.

Ans. No net force is the correct answer. An object at rest can have several forces acting on it. When you add up all the forces, if the answer is zero, the object will remain at rest.

36 a) As you stand on a floor, does the floor exert an upward force against your feet? b) How much force does it exert? c) Why are you not moved upward by this force?

Ans. a) Yes. b) A force equal to your weight. c) Gravity is pulling you down and the floor is pushing you up. These forces are equal in magnitude and opposite in direction so the net force on you is zero.

38. Pull horizontally on a crate with a force of 200 newtons and it slides across the floor in dynamic equilibrium. How much friction is acting on the crate?

Ans. 200 newtons in the opposite direction.

Ch. 2 Pg. 40 Exercises continued; Conceptual Physics-11th edition

43. A child learns in school that the Earth is traveling faster than 100,000 kilometers per hour around the sun and in a frightened tone asks you why we aren't swept off. What is your answer?

Ans. We are also moving around the sun at 100,000 kilometers per hour.

45. Because the earth rotates once per 24 hours, the western wall in your room moves toward you at a linear speed of about 800 miles/ hour. When you stand facing the wall you are carried along at the same speed, so you don't notice it. But when you jump upward, with your feet no longer in contact with the floor, why doesn't the high-speed wall slam into you?

Ans. When you jump upward, you are still moving east with a speed of 800 miles/hour, so the western wall, which is also moving east at 800 miles/hour, cannot catch you.

47. The chimney of a stationary toy train consists of a vertical spring gun that shoots a steel ball a meter or so straight into the air-so straight that the ball always falls back into the chimney. Suppose the train moves at constant speed along the straight track. a) Do you think the ball will still return to the chimney if it is shot from the moving train? b) How about if the train accelerates along the straight track? c) How about if it moves at a constant speed on a circular track? d) Why are your answers different?

Ans. a) Yes. b) No. c) No. d) The train changes its horizontal velocity while the ball is in the air but the horizontal velocity of the ball does not change.

Extra: Why did Galileo use incline planes to investigate free fall?

Ans. Objects in free fall, near the Earth's surface, accelerate down at 10m/s/s when we disregard air friction. In a short amount of time, freely falling objects are moving quite rapidly. In order to calculate the acceleration, one must determine the position of the object at known times. Galileo did not have the benefit of today's accurate timing devices so he used an inclined plane to slow down the motion of a falling object.