ch 5

Chapter 5: Force and Newton's Laws

Conceptual problems

5.C.1 (5.00) Can an object move if there is no net force on it? Explain.

Yes No

5.C.2 (5.00) Suppose you apply a force of 1 N to block A and a force of 2 N to block B. Does it follow that block B has twice the acceleration of block A? Justify your answer using Newton's second law.

Yes No

5.C.3 (5.00) When a brick rests on a flat, stationary, horizontal table, there is an upward normal force on it from the table. Explain why the brick does not accelerate upward in response to this force.

5.C.4 (5.00) A rocket in space can change course with its engines. Since in empty space there is nothing for the exhaust gases to push on, how can it accelerate?

5.C.5 (5.00) Blocks 1 and 2, and 2 and 3 are connected by two identical thin wires. All three blocks are resting on a frictionless table. Block 1 is pulled by a constant force and all three blocks accelerate equally in a line, with block 1 leading. Are the tensions in the two wires the same or different? If the tensions are different, which has the larger magnitude? Why?

5.C.6 (5.00) Two blocks of different mass are connected by a massless rope which goes over a massless, frictionless pulley. The rope is free to move, and both of the blocks hang vertically. What is the magnitude of the tension in the rope?

5.C.7 (5.00) Why is the frictional force proportional to the normal force, and not weight?

5.C.8 (5.00) A college rower can easily push a small car along a flat road, but she cannot lift the car in the air. Since the mass of the car is constant, how can you explain this discrepancy?

5.C.9 (5.00) Without friction, you would not be able to walk along a level sidewalk. Why? (Imagine being stranded in the middle of an ice rink, wearing shoes made of ice.)

5.C.10 (5.00) If an acrobat who weighs 800 N is clinging to a vertical pole using only his hands, neither moving up nor down, can we determine the coefficient of static friction between his hands and the pole? Explain your answer.

○ Yes ○ No

5.C.11 (5.00) State two reasons why it is easier to push a heavy object down a hill than it is to push that same object across a flat, horizontal surface.

5.C.12 (5.00) One end of a spring is attached firmly to a wall, and a block is attached to the other end. When the spring is fully compressed, it exerts a force F on the block, and when the spring is fully extended, the force it exerts on the block is $-F$. What is the force of the spring on the block at (a) equilibrium (neither compressed nor stretched), (b) halfway between maximum stretch and equilibrium, and (c) halfway between maximum compression and equilibrium? Carefully consider the signs in your answer, which indicate direction, and express your answers in terms of F.

(a)
(b)
(c)

5.C.13 (5.00) From the example of the falling cat, we see that the cross-sectional area of a falling object affects its terminal velocity. Does an object's mass also affect its terminal velocity? Why or why not?

Yes No

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