## ANSWERS TO EVEN-NUMBERED CONCEPTUAL QUSTIONS

**2.** $w = mg$ and $g$ decreases with altitude. Thus, to get a good buy, purchase it in Denver. If gold were sold by mass, it would not matter where you bought it.

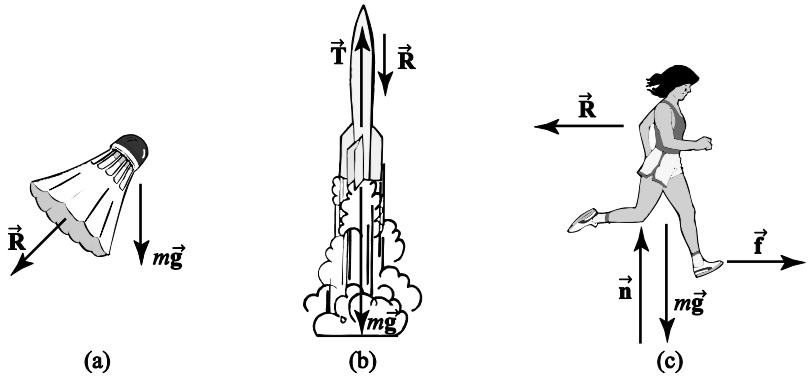
**4.** If it has a large mass, it will take a large force to alter its motion even when floating in space. Thus, to avoid injuring himself, he should push it gently toward the storage compartment.

**6.** The barbell always exerts a downward force on the lifter equal in magnitude to the upward force that she exerts on the barbell. Since the lifter is in equilibrium, the magnitude of the upward force exerted on her by the scale (that is, the scale reading) equals the sum of her weight and the downward force exerted by the barbell. As the barbell goes through the bottom of the cycle and is being lifted upward, the scale reading exceeds the combined weights of the lifter and the barbell. At the top of the motion and as the barbell is allowed to move back downward, the scale reading is less than the combined weights. If the barbell is moving upward, the lifter can declare she has thrown it just by letting go of it for a moment. Thus, the case is included in the previous answer.

**8.** The net force acting on the object decreases as the resistive force increases. Eventually, the resistive force becomes equal to the weight of the object, and the net force goes to zero. In this condition, the object stops accelerating, and the velocity stays constant. The rock has reached its terminal velocity.

**10.** While the engines operate, their total upward thrust exceeds the weight of the rocket, and the rocket experiences a net upward force. This net force causes the upward velocity of the rocket to increase in magnitude (speed). The upward thrust of the engines is constant, but the remaining mass of the rocket (and hence, the downward gravitational force or weight) decreases as the rocket consumes its fuel. Thus, there is an increasing net upward force acting on a diminishing mass. This yields an acceleration that increases in time.

**12.**



In the free-body diagrams give above, $\vec{\mathbf{R}}$ represents a force due to air resistance, $\vec{\mathbf{T}}$ is a force due to the thrust of the rocket engine, $\vec{\mathbf{n}}$ is a normal force, $\vec{\mathbf{f}}$ is a friction force, and the forces labeled $m\vec{\mathbf{g}}$ are gravitational forces.

**14.** If the brakes lock, the car will travel farther than it would travel if the wheels continued to roll, because the coefficient of kinetic friction is less than that of static friction. Hence, the force of kinetic friction is less than the maximum force of static friction.