

Physics

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HW #7

Problems

{ Ch 9: Q: 27, 31, 49; E: 12, 13, 19
(Ch 10: Q: 1, 7; E: 3, 5

27. Assume you are standing on a bathroom scale while an elevator slows down to stop at the top floor. Will the reading on the scale be greater than, equal to, or less than the reading after the elevator stops? Why?

*31. Assume that a meter-stick balance is balanced with a 20-gram mass at 40 centimeters from the center and a 40-gram mass at 20 centimeters from the center. Will it remain balanced if it is in an elevator accelerating downward? Explain your reasoning.

49. Would a Foucault pendulum rotate at the equator? Explain your reasoning.

12. An elevator is moving downward and slowing down with an acceleration equal to one-quarter that of gravity. If a person who weighs 800 N when at rest on Earth steps on a bathroom scale in this elevator, what will the scale read?

13. An 8-kg monkey rides on a bathroom scale in an elevator that is accelerating upward at $\frac{1}{4}g$. What does the scale read?

*19. A cylindrical space station with a 40-m radius is rotating so that points on the walls have speeds of 20 m/s. What is the acceleration due to this artificial gravity at the walls?

1. If you were located in a spaceship traveling with a constant velocity somewhere in the Galaxy, could you devise experiments to determine your speed? If so, what kinds of experiments?

7. An observer in the train in the figure stands in the back of the car. He turns on a light and measures the time it takes for the light to get to the front of the car, bounce off a mirror, and return to him. (Assume that the light is traveling in a vacuum.) Knowing the length of the car, he is able to calculate the speed of light. Will he obtain a speed less than, greater than, or equal to c ? Explain.

3. When Venus is closest to Earth, it is approximately 45 million km away. If the radio telescope at Arecibo, Puerto Rico, bounces a radio signal from Venus's surface, how long will it take the radio signal to make the round-trip?

5. What is the size of the adjustment factor for a speed of $0.4c$?