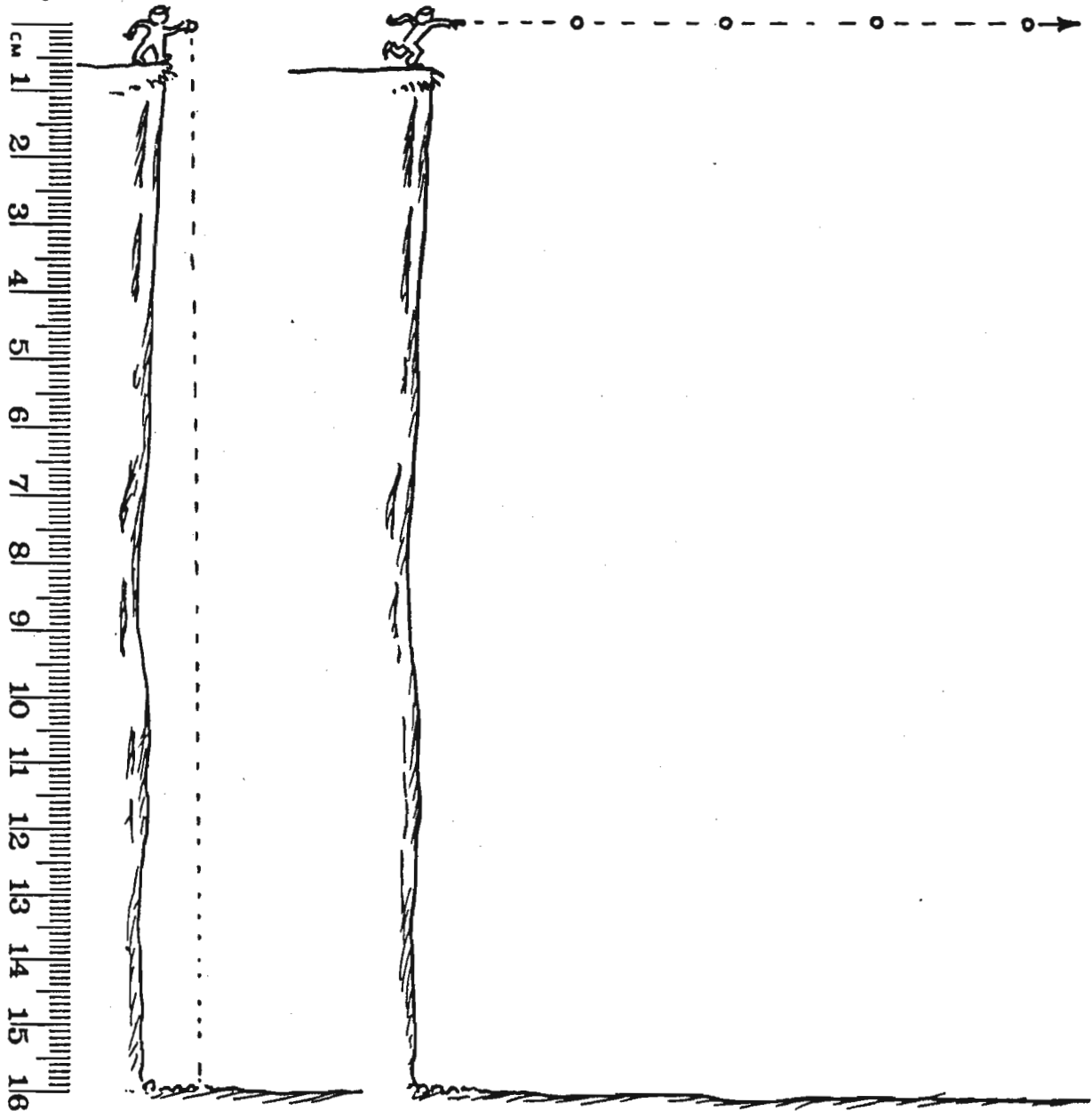


Concept-Development Practice Page

3-1

Projectile Motion

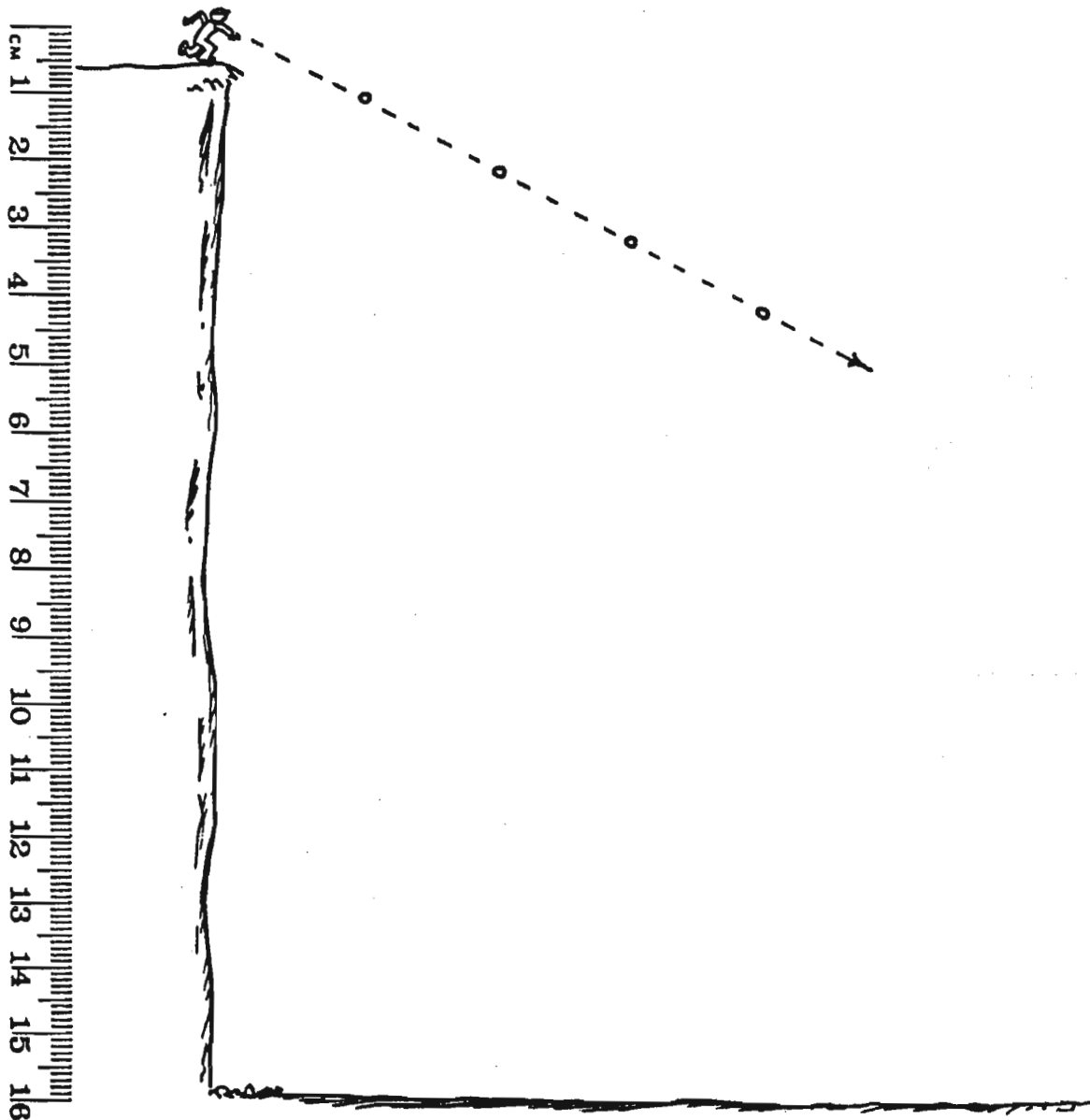


1. Above left: Use the scale 1 cm: 5 m and draw the positions of the dropped ball at 1-second intervals. Neglect air drag and assume $g = 10 \text{ m/s}^2$. Estimate the number of seconds the ball is in the air.

_____ seconds.

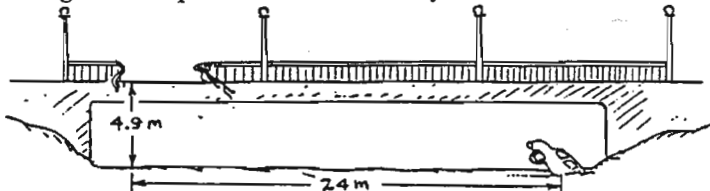
2. Above right: The four positions of the thrown ball with *no gravity* are at 1-second intervals. At 1 cm: 5 m, carefully draw the positions of the ball *with gravity*. Neglect air drag and assume $g = 10 \text{ m/s}^2$. Connect your positions with a smooth curve to show the path of the ball. How is the motion in the vertical direction affected by motion in the horizontal direction?

Conceptual PHYSICS



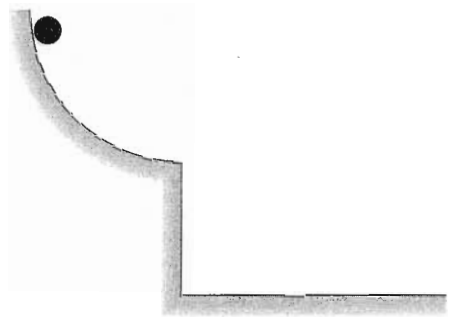
3. This time the ball is thrown below the horizontal. Use the same scale 1 cm: 5 m and carefully draw the positions of the ball as it falls beneath the dashed line. Connect your positions with a smooth curve. Estimate the number of seconds the ball remains in the air. _____ s

4. Suppose that you are an accident investigator and you are asked to figure whether or not the car was speeding before it crashed through the rail of the bridge and into the mudbank as shown. The speed limit on the bridge is 55 mph = 24 m/s. What is your conclusion?

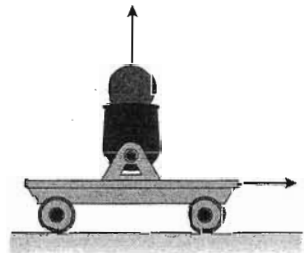


3.7 Projectile Motion: Solving Problems

37. The figure shows a ball that rolls down a quarter-circle ramp, then off a cliff. Sketch the ball's trajectory from the instant it is released until it hits the ground.

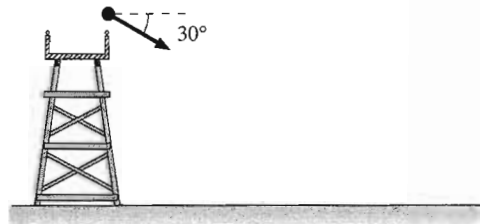


38. a. A cart that is rolling at constant velocity fires a ball straight up. When the ball comes back down, will it land in front of the launching tube, behind the launching tube, or directly in the tube? Explain.



b. Will your answer change if the cart is accelerating in the forward direction? If so, how?

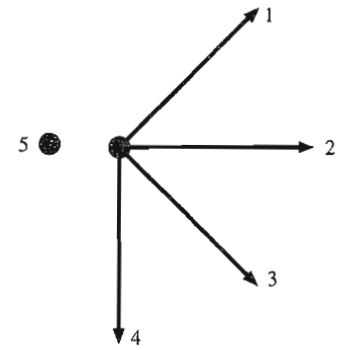
39. A rock is thrown from a bridge at an angle 30° below horizontal.



- a. Sketch the rock's trajectory on the figure.
- b. Immediately after the rock is released, is the magnitude of its acceleration greater than, less than, or equal to g ? Explain.

c. At the instant of impact, is the rock's speed greater than, less than, or equal to the speed with which it was thrown? Explain.

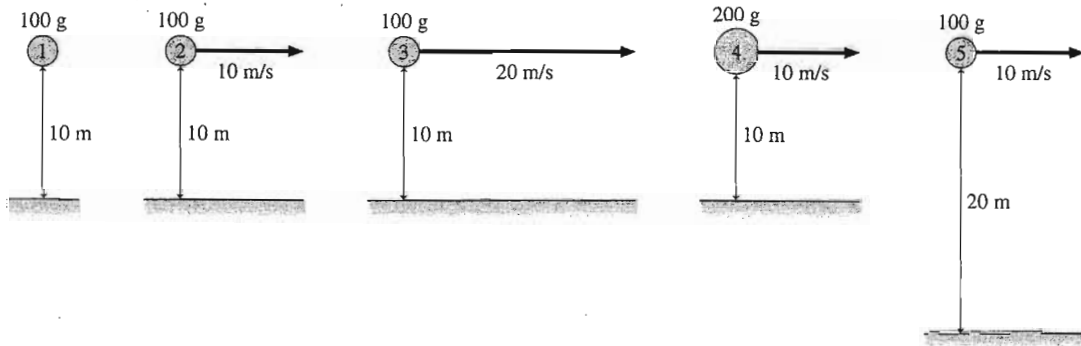
40. Four balls are simultaneously launched with the same speed from the same height h above the ground. At the same instant, ball 5 is released from rest at the same height. Rank in order, from shortest to longest, the amount of time it takes each of these balls to hit the ground. (Some may be simultaneous.)



Order:

Explanation:

41. Rank in order, from shortest to longest, the amount of time it takes each of these projectiles to hit the ground. (Some may be simultaneous.)



Order:

Explanation:

3.8 Motion in Two Dimensions: Circular Motion

42. a. The crankshaft in your car rotates at 3000 rpm. What is the frequency in revolutions per second?

b. A record turntable rotates at 33.3 rpm. What is the period in seconds?