

Free Fall Problems

Worksheet

14 Practice Questions

Organic Chemistry Tutor

1. A ball is dropped from rest on a cliff. (a) What is the speed of the ball 5 seconds later? (b) What is the velocity of the ball at this time? (c) How far does it travel during this time? (d) What is the displacement of the ball?

3. A stone is dropped from the top of a building and hits the ground 5 seconds later. How tall is the building?

2. A ball is thrown downward at an initial speed of 15 m/s from the top of a cliff. (a) What is the speed and velocity of the ball 8 seconds later? (b) How far does it travel during this time and what is its displacement?

4. A stone is thrown downward from the top of a cliff at 24 m/s and hits the ground 7 seconds later. How tall is the cliff?

5. A rock is released from rest on a 700 m building.
(a) How long does it take to hit the ground?
(b) What is the speed and velocity of the ball just before it hits the ground?

7. A ball is thrown straight up into the air at 49 m/s. (a) How high does it go? (b) How long is it in the air?

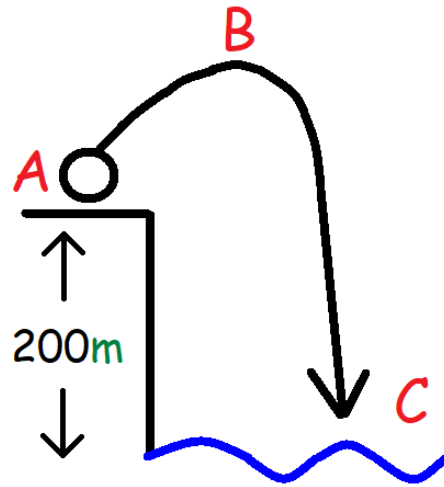
6. A stone is released from rest on a cliff and the sound it makes when it hits the water is heard 17.2 seconds later. If the speed of sound is 343 m/s, how tall is the cliff relative to the ocean?

8. A stone is launched straight up into the air and returns to the ground 14 seconds later.
(a) What is the initial speed of the ball?
(b) What is the maximum height attained by it?

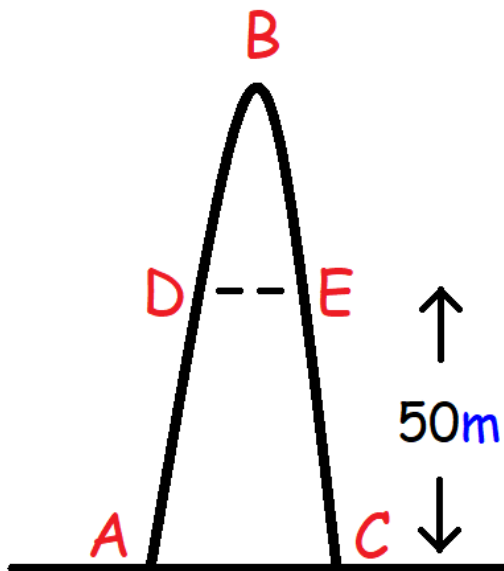
9. A cat jumps 1.8 m vertically in the air.

- (a) How long was the cat in the air?
- (b) What was its initial speed?

11. A rock is thrown upward at 30 m/s from a 200 m cliff relative to the sea. (a) How long will it take to hit the water? (b) How fast is it moving when it hits the water? (c) What is the maximum height attained relative to the sea? (d) How far did the ball travel? (e) What is the net vertical displacement of the ball?



10. A ball is launched vertically from the ground at a speed of 35 m/s. (a) What is the velocity of the ball when it reaches a height of 50 m? (D & E)
(b) How long will it take to reach this height?



12. A toy rocket blasts off straight up from the ground with an average acceleration of 30 m/s^2 for 20 seconds. (a) What is the maximum height attained by this rocket? (b) What is the total amount of time that the rocket is in the air?

13. Karen points a garden hose straight upward 2 m above the ground. The water leaves the hose and falls back to the ground 3 seconds later. What is the speed of the water when it exits the garden hose?

14. A ball is thrown downward with an initial speed of 20 m/s from a height of 200 m above the ground. At the same instant, a second ball is thrown upward from the ground at a speed of 80 m/s. At what height above the ground will the two objects meet?

Answers:

1a. +49 m/s

1b. -49 m/s in the -y direction

1c. +122.5 m

1d. -122.5 m in the -y direction

2a. Speed = +93.4 m/s, Velocity = -93.4 m/s

2b. Distance = 433.6 m, Displacement = -433.6 m

3. 122.5 m

4. 408.1 m

5a. 11.95 s

5b. Speed = 117.1 m/s, Velocity = -117.1 m/s

6. 1000 m

7a. 122.5 m

7b. 10 seconds

8a. 68.6 m/s

8b. 240 m

9a. 1.2 s

9b. 5.9 m/s

10a. +15.7 m/s at point D, -15.7 m/s at point E

10b. 1.97 s to reach point D, 5.17 s to point E

11a. 10.1 s

11b. 69 m/s

11c. 246 m

11d. 292 m

11e. -200 m

12a. 24,367 m or 24.4 km

12b. 152 s

13. 14 m/s

14. 140 m