

Free Fall

Activity 1: Describing Free Fall

Question Group 1

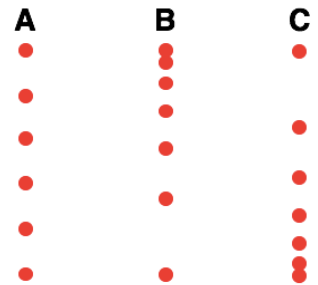
Question 1

Which of the dot diagrams best describe the motion of a free-falling object that is dropped from rest?

Diagram A

Diagram B

Diagram C



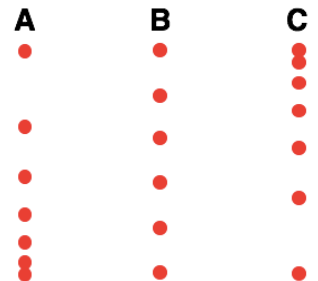
Question 2

Which of the dot diagrams best describe the motion of a free-falling object that is dropped from rest?

Diagram A

Diagram B

Diagram C



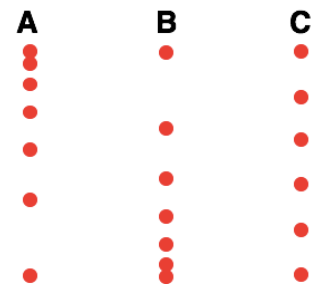
Question 3

Which of the dot diagrams best describe the motion of a free-falling object that is dropped from rest?

Diagram A

Diagram B

Diagram C



Question Group 2

Question 4

A paint brush is dropped from the top of a tall ladder and free falls to the ground. What changes, if any, would be observed of the velocity and the acceleration of the brush as it falls? Pick the two answers.

The velocity increases.

The velocity decreases.

The velocity remains a constant value.

The acceleration increases.

The acceleration decreases.

The acceleration remains a constant value.

Question 5

A textbook is dropped from the second story stairs and free falls to the ground. What changes, if any, would be observed of the velocity and the acceleration of the textbook as it falls? Pick two answers.

The velocity increases.

The velocity decreases.

The velocity remains a constant value.

The acceleration increases.

The acceleration decreases.

The acceleration remains a constant value.

Question Group 3**Question 6**

A tennis ball is hit straight upwards and undergoes a free fall motion as it rises towards its highest point. What changes, if any, would be observed of the velocity and the acceleration of the tennis ball as it rises towards its highest point? Pick two answers.

The velocity increases.

The velocity decreases.

The velocity remains a constant value.

The acceleration increases.

The acceleration decreases.

The acceleration remains a constant value.

Question 7

A baseball is thrown straight upwards from the ground and undergoes a free fall motion as it rises towards its highest point. What changes, if any, would be observed of the velocity and the acceleration of the baseball as it rises towards its highest point? Pick two answers.

The velocity increases.

The velocity decreases.

The velocity remains a constant value.

The acceleration increases.

The acceleration decreases.

The acceleration remains a constant value.

Question Group 4**Question 8**

A tennis ball is hit straight upwards and undergoes a free fall motion as it rises towards its highest point and then fall back downward to the ground. What changes, if any, would be observed of the velocity and the acceleration of the tennis ball as it falls downward from its highest point? Pick two answers.

The velocity increases.

The velocity decreases.

The velocity remains a constant value.

The acceleration increases.

The acceleration decreases.

The acceleration remains a constant value.

Question 9

A baseball is thrown straight upwards from the ground and undergoes a free fall motion as it rises towards its highest point and then fall back downward to the ground. What changes, if any, would be observed of the velocity and the acceleration of the baseball as it falls downward from its highest point? Pick two answers.

The velocity increases.

The velocity decreases.

The velocity remains a constant value.

The acceleration increases.

The acceleration decreases.

The acceleration remains a constant value.

Question Group 5

Question 10

Velocity and acceleration are both vectors; they have a direction. What is the direction of the velocity and acceleration vectors of a tennis ball that is rising upward towards its highest point above the ground? Pick two answers.

The velocity vector is directed upward.

The velocity vector is directed downward.

The acceleration vector is directed upward.

The acceleration vector is directed downward.

Question 11

Velocity and acceleration are both vectors; they have a direction. What is the direction of the velocity and acceleration vectors of a baseball that is rising upward towards its highest point above the ground? Pick two answers.

The velocity vector is directed upward.

The velocity vector is directed downward.

The acceleration vector is directed upward.

The acceleration vector is directed downward.

Question Group 6

Question 12

Velocity and acceleration are both vectors; they have a direction. What is the direction of the velocity and acceleration vectors of a tennis ball that is falling downward from its highest point towards the ground? Pick two answers.

The velocity vector is directed upward.

The velocity vector is directed downward.

The acceleration vector is directed upward.

The acceleration vector is directed downward.

Question 13

Velocity and acceleration are both vectors; they have a direction. What is the direction of the velocity and acceleration vectors of a tennis ball that is falling downward from its highest point towards the ground? Pick two answers.

The velocity vector is directed upward.

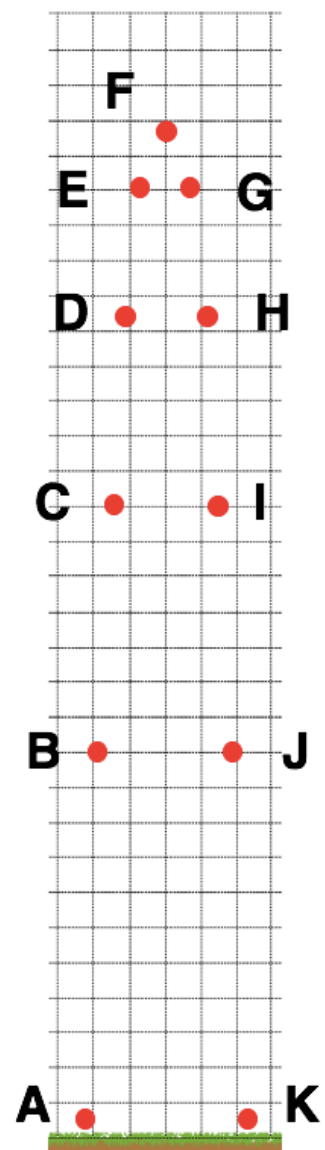
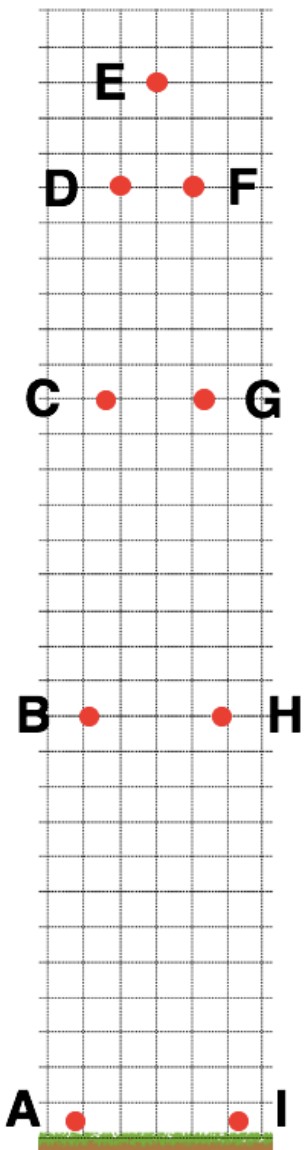
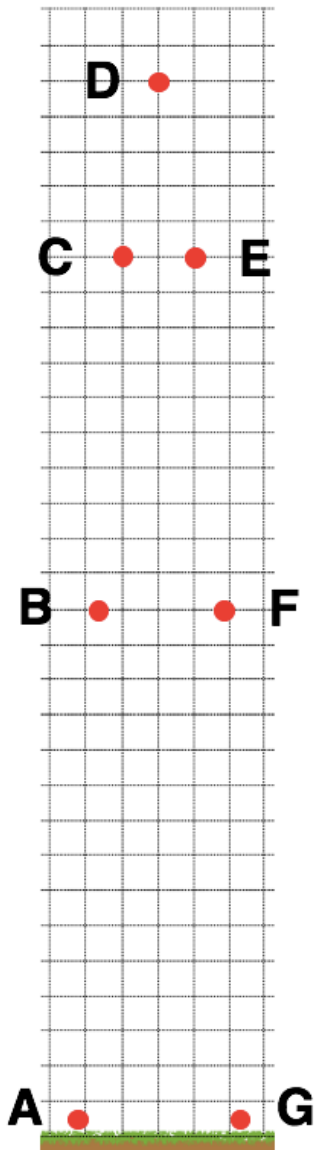
The velocity vector is directed downward.

The acceleration vector is directed upward.

The acceleration vector is directed downward.

Activity 2: Speedometer

Three different graphics appear repeatedly in Activity 2. They are shown below. The left graphic is associated with all 30 m/s launch speeds. The middle graphic is associated with all 40 m/s launch speeds. And the right graphic is associated with all 50 m/s launch speeds.



Question Group 7

Question 14

A ball is projected upward with an initial speed of approximately 30 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball have a speed of 0 m/s?

Question 15

A ball is projected upward with an initial speed of approximately 40 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball have a speed of 0 m/s?

Question 16

A ball is projected upward with an initial speed of approximately 50 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball have a speed of 0 m/s?

Question Group 8**Question 17**

A ball is projected upward with an initial speed of approximately 30 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving upward with a speed of approximately 20 m/s?

Question 18

A ball is projected upward with an initial speed of approximately 40 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving upward with a speed of approximately 30 m/s?

Question 19

A ball is projected upward with an initial speed of approximately 50 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving upward with a speed of approximately 40 m/s?

Question Group 9**Question 20**

A ball is projected upward with an initial speed of approximately 30 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 10 m/s?

Question 21

A ball is projected upward with an initial speed of approximately 40 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 10 m/s?

Question 22

A ball is projected upward with an initial speed of approximately 50 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 10 m/s?

Question Group 10**Question 23**

A ball is projected upward with an initial speed of approximately 30 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 20 m/s?

Question 24

A ball is projected upward with an initial speed of approximately 40 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 20 m/s?

Question 25

A ball is projected upward with an initial speed of approximately 50 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 20 m/s?

Question Group 11**Question 26**

A ball is projected upward with an initial speed of approximately 30 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 30 m/s?

Question 27

A ball is projected upward with an initial speed of approximately 40 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 30 m/s?

Question 28

A ball is projected upward with an initial speed of approximately 50 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving downward with a speed of approximately 30 m/s?

Question Group 12

Question 29

A ball is projected upward with an initial speed of approximately 30 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving upward with a speed of approximately 10 m/s?

Question 30

A ball is projected upward with an initial speed of approximately 40 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving upward with a speed of approximately 10 m/s?

Question 31

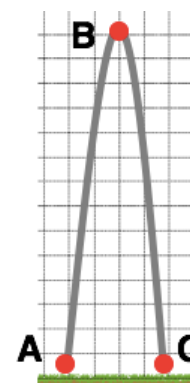
A ball is projected upward with an initial speed of approximately 50 m/s. The diagram at the right represents its position at 1-second intervals of time. At what location will the ball be moving upward with a speed of approximately 10 m/s?

Activity 3: It's About Time

Question Group 13

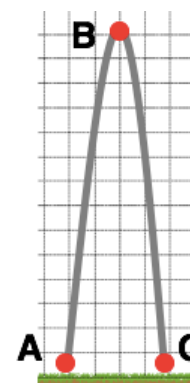
Question 32

A ball is thrown upward with a speed of 30 m/s. Approximately how much time goes it take the ball to travel from the release location (A) to its highest point (B)? Approximately how much total time is the ball in the air before it returns toback to its original height (C)?



Question 33

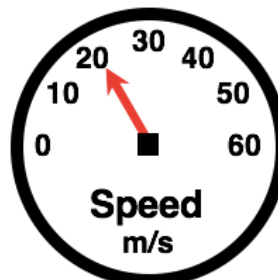
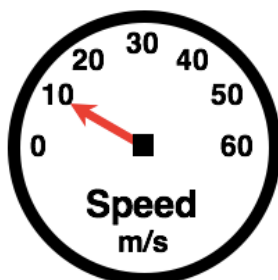
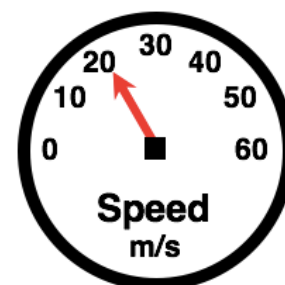
A ball is thrown upward with a speed of 40 m/s. Approximately how much time goes it take the ball to travel from the release location (A) to its highest point (B)? Approximately how much total time is the ball in the air before it returns toback to its original height (C)?



Question Group 14

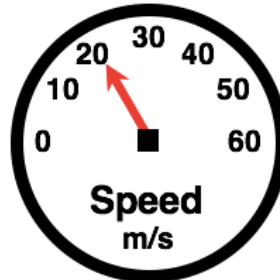
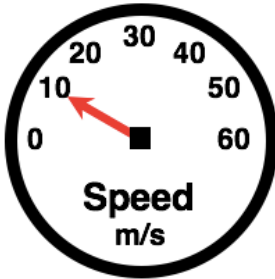
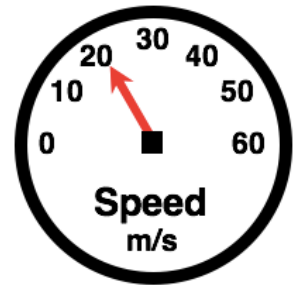
Question 34

A ball is equipped with a speedometer and launched straight upward. The speedometer reading two seconds after launch is shown at the right; the ball is moving upward. At what approximate times would the ball be moving downward and display the following speedometer readings?

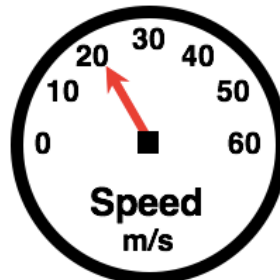
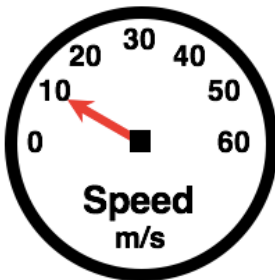
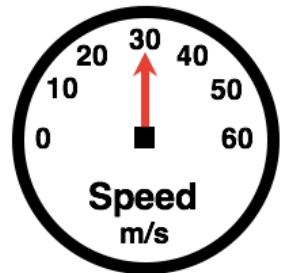


Question 35

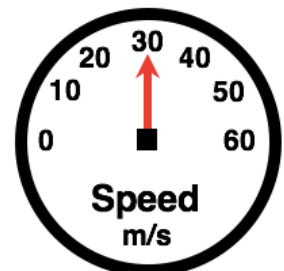
A ball is equipped with a speedometer and launched straight upward. The speedometer reading three seconds after launch is shown at the right; the ball is moving upward. At what approximate times would the ball be moving downward and display the following speedometer readings?

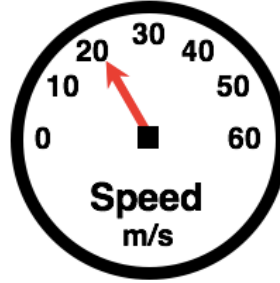
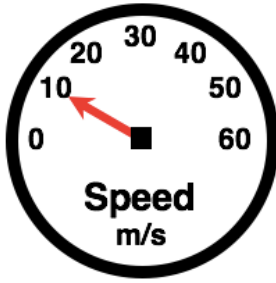
**Question Group 15****Question 36**

A ball is equipped with a speedometer and launched straight upward. The speedometer reading two seconds after launch is shown at the right; the ball is moving upward. At what approximate times would the ball be moving downward and display the following speedometer readings?

**Question 37**

A ball is equipped with a speedometer and launched straight upward. The speedometer reading three seconds after launch is shown at the right; the ball is moving upward. At what approximate times would the ball be moving downward and display the following speedometer readings?

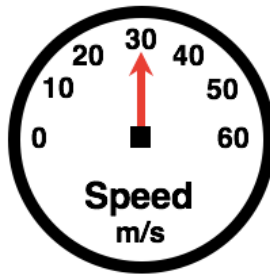
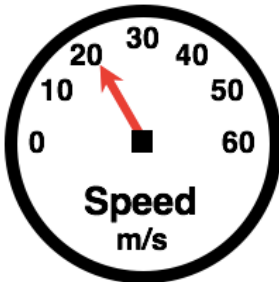
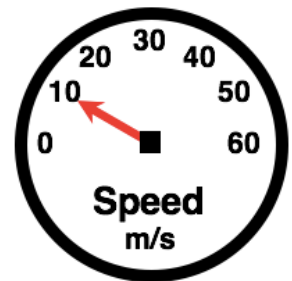




Question Group 16

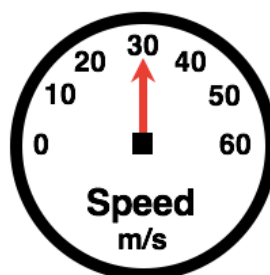
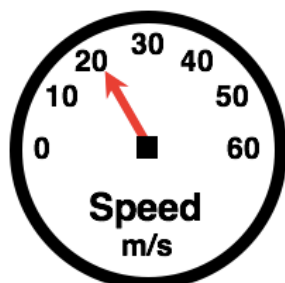
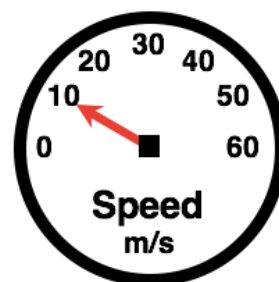
Question 38

A ball is equipped with a speedometer and launched straight upward. The speedometer reading four seconds after launch is shown at the right; the ball is moving downward. At what approximate times would the ball be moving upward and display the following speedometer readings?



Question 39

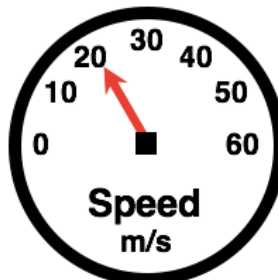
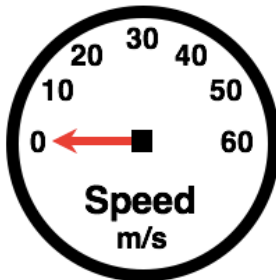
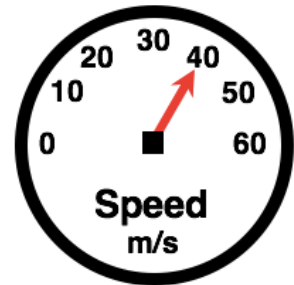
A ball is equipped with a speedometer and launched straight upward. The speedometer reading five seconds after launch is shown at the right; the ball is moving downward. At what approximate times would the ball be moving upward and display the following speedometer readings?



Question Group 17

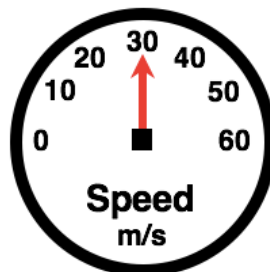
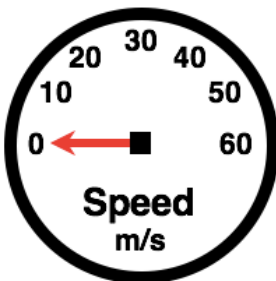
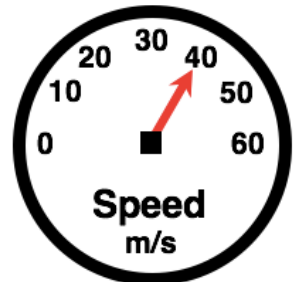
Question 40

A ball is equipped with a speedometer and launched straight upward. The speedometer reading two seconds after launch is shown at the right; the ball is moving upward. At what approximate times would the ball display the following speedometer readings?



Question 41

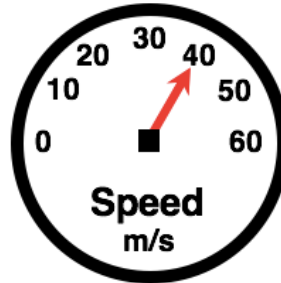
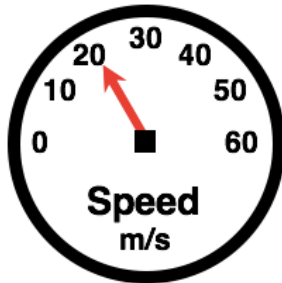
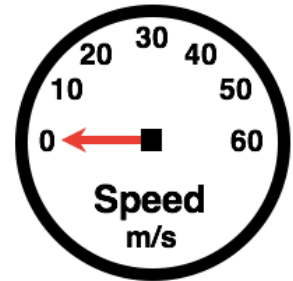
A ball is equipped with a speedometer and launched straight upward. The speedometer reading three seconds after launch is shown at the right; the ball is moving upward. At what approximate times would the ball display the following speedometer readings?



Question Group 18

Question 42

A ball is equipped with a speedometer and launched straight upward. The speedometer reading three seconds after launch is shown at the right. At what approximate times would the ball be moving upward and display the following speedometer readings?



Question 43

A ball is equipped with a speedometer and launched straight upward. The speedometer reading four seconds after launch is shown at the right. At what approximate times would the ball be moving upward and display the following speedometer readings?

