A piece of fruit falls straight down. As it falls,

A. the gravitational force does positive work on it and the gravitational potential energy increases.

B. the gravitational force does positive work on it and the gravitational potential energy decreases.

C. the gravitational force does negative work on it and the gravitational potential energy increases.

D. the gravitational force does negative work on it and the gravitational potential energy decreases.
A piece of fruit falls straight down. As it falls,

A. the gravitational force does positive work on it and the gravitational potential energy increases.

B. the gravitational force does positive work on it and the gravitational potential energy decreases.

C. the gravitational force does negative work on it and the gravitational potential energy increases.

D. the gravitational force does negative work on it and the gravitational potential energy decreases.
Q7.2
You toss a 0.150-kg baseball straight upward so that it leaves your hand moving at 20.0 m/s. The ball reaches a maximum height $y_2$. What is the speed of the ball when it is at a height of $y_2/2$? Ignore air resistance.

A. 10.0 m/s
B. less than 10.0 m/s but greater than zero
C. greater than 10.0 m/s
D. not enough information given to decide
You toss a 0.150-kg baseball straight upward so that it leaves your hand moving at 20.0 m/s. The ball reaches a maximum height $y_2$.

What is the speed of the ball when it is at a height of $y_2/2$? Ignore air resistance.

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B. less than 10.0 m/s but greater than zero

C. greater than 10.0 m/s

D. not enough information given to decide
Q7.3

As a rock slides from \( A \) to \( B \) along the inside of this frictionless hemispherical bowl, mechanical energy is conserved. Why?

(Ignore air resistance.)

A. The bowl is hemispherical.
B. The normal force is balanced by centrifugal force.
C. The normal force is balanced by centripetal force.
D. The normal force acts perpendicular to the bowl’s surface.
E. The rock’s acceleration is perpendicular to the bowl’s surface.
As a rock slides from A to B along the inside of this frictionless hemispherical bowl, mechanical energy is conserved. Why?

(Ignore air resistance.)

A. The bowl is hemispherical.

B. The normal force is balanced by centrifugal force.

C. The normal force is balanced by centripetal force.

D. The normal force acts perpendicular to the bowl’s surface.

E. The rock’s acceleration is perpendicular to the bowl’s surface.
The two ramps shown are both frictionless. The heights $y_1$ and $y_2$ are the same for each ramp. A block of mass $m$ is released from rest at the left-hand end of each ramp. Which block arrives at the right-hand end with the greater speed?

A. the block on the curved track
B. the block on the straight track
C. Both blocks arrive at the right-hand end with the same speed.
D. The answer depends on the shape of the curved track.
The two ramps shown are both frictionless. The heights $y_1$ and $y_2$ are the same for each ramp. A block of mass $m$ is released from rest at the left-hand end of each ramp. Which block arrives at the right-hand end with the greater speed?

A. the block on the curved track

B. the block on the straight track

C. Both blocks arrive at the right-hand end with the same speed.

D. The answer depends on the shape of the curved track.
A block is released from rest on a frictionless incline as shown. When the moving block is in contact with the spring and compressing it, what is happening to the gravitational potential energy $U_{\text{grav}}$ and the elastic potential energy $U_{\text{el}}$?

A. $U_{\text{grav}}$ and $U_{\text{el}}$ are both increasing.

B. $U_{\text{grav}}$ and $U_{\text{el}}$ are both decreasing.

C. $U_{\text{grav}}$ is increasing; $U_{\text{el}}$ is decreasing.

D. $U_{\text{grav}}$ is decreasing; $U_{\text{el}}$ is increasing.

E. The answer depends on how the block’s speed is changing.
A block is released from rest on a frictionless incline as shown. When the moving block is in contact with the spring and compressing it, what is happening to the gravitational potential energy $U_{\text{grav}}$ and the elastic potential energy $U_{\text{el}}$?

A. $U_{\text{grav}}$ and $U_{\text{el}}$ are both increasing.

B. $U_{\text{grav}}$ and $U_{\text{el}}$ are both decreasing.

C. $U_{\text{grav}}$ is increasing; $U_{\text{el}}$ is decreasing.

D. $U_{\text{grav}}$ is decreasing; $U_{\text{el}}$ is increasing.

E. The answer depends on how the block’s speed is changing.
Q7.6

The graph shows the potential energy $U$ for a particle that moves along the $x$-axis.

The particle is initially at $x = d$ and moves in the negative $x$-direction. At which of the labeled $x$-coordinates does the particle have the greatest speed?

A. at $x = a$  
B. at $x = b$  
C. at $x = c$  
D. at $x = d$  
E. more than one of the above
The graph shows the potential energy $U$ for a particle that moves along the $x$-axis.

The particle is initially at $x = d$ and moves in the negative $x$-direction. At which of the labeled $x$-coordinates does the particle have the greatest speed?

A. at $x = a$  ✔️ B. at $x = b$  C. at $x = c$  D. at $x = d$

E. more than one of the above
The graph shows the potential energy $U$ for a particle that moves along the $x$-axis.

The particle is initially at $x = d$ and moves in the negative $x$-direction. At which of the labeled $x$-coordinates is the particle slowing down?

A. at $x = a$       B. at $x = b$       C. at $x = c$       D. at $x = d$

E. more than one of the above
The graph shows the potential energy $U$ for a particle that moves along the $x$-axis.

The particle is initially at $x = d$ and moves in the negative $x$-direction. At which of the labeled $x$-coordinates is the particle slowing down?

- A. at $x = a$
- B. at $x = b$
- C. at $x = c$
- D. at $x = d$
- E. more than one of the above

✓ A. at $x = a$
The graph shows the potential energy $U$ for a particle that moves along the $x$-axis. At which of the labeled $x$-coordinates is there zero force on the particle?

A. at $x = a$ and $x = c$

B. at $x = b$ only

C. at $x = d$ only

D. at $x = b$ and $d$

E. misleading question—there is a force at all values of $x$
The graph shows the potential energy $U$ for a particle that moves along the $x$-axis. At which of the labeled $x$-coordinates is there zero force on the particle?

A. at $x = a$ and $x = c$

B. at $x = b$ only

C. at $x = d$ only

D. at $x = b$ and $d$

E. misleading question—there is a force at all values of $x$
The graph shows a conservative force $F_x$ as a function of $x$ in the vicinity of $x = a$. As the graph shows, $F_x = 0$ at $x = a$. Which statement about the associated potential energy function $U$ at $x = a$ is correct?

A. $U = 0$ at $x = a$

B. $U$ is a maximum at $x = a$.

C. $U$ is a minimum at $x = a$.

D. $U$ is neither a minimum or a maximum at $x = a$, and its value at $x = a$ need not be zero.
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C. $U$ is a minimum at $x = a$.

D. $U$ is neither a minimum or a maximum at $x = a$, and its value at $x = a$ need not be zero.
A7.10

The graph shows a conservative force $F_x$ as a function of $x$ in the vicinity of $x = a$. As the graph shows, $F_x = 0$ at $x = a$. Which statement about the associated potential energy function $U$ at $x = a$ is correct?

A. $U = 0$ at $x = a$

B. $U$ is a maximum at $x = a$.

C. $U$ is a minimum at $x = a$.

D. $U$ is neither a minimum or a maximum at $x = a$, and its value at $x = a$ need not be zero.
Q7.11

The graph shows a conservative force $F_x$ as a function of $x$ in the vicinity of $x = a$. As the graph shows, $F_x > 0$ and $dF_x/dx < 0$ at $x = a$. Which statement about the associated potential energy function $U$ at $x = a$ is correct?

A. $dU/dx > 0$ at $x = a$
B. $dU/dx < 0$ at $x = a$
C. $dU/dx = 0$ at $x = a$
D. Any of the above could be correct.
A7.11

The graph shows a conservative force $F_x$ as a function of $x$ in the vicinity of $x = a$. As the graph shows, $F_x > 0$ and $dF_x/dx < 0$ at $x = a$. Which statement about the associated *potential* energy function $U$ at $x = a$ is correct?

A. $dU/dx > 0$ at $x = a$

B. $dU/dx < 0$ at $x = a$ **(Correct)**

C. $dU/dx = 0$ at $x = a$

D. Any of the above could be correct.
You push a block up an inclined ramp at a constant speed. There is friction between the block and the ramp.

The rate at which the internal energy of the block and ramp increases is

A. greater than the rate at which you do work on the block.
B. the same as the rate at which you do work on the block.
C. less than the rate at which you do work on the block.
D. not enough information given to decide
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