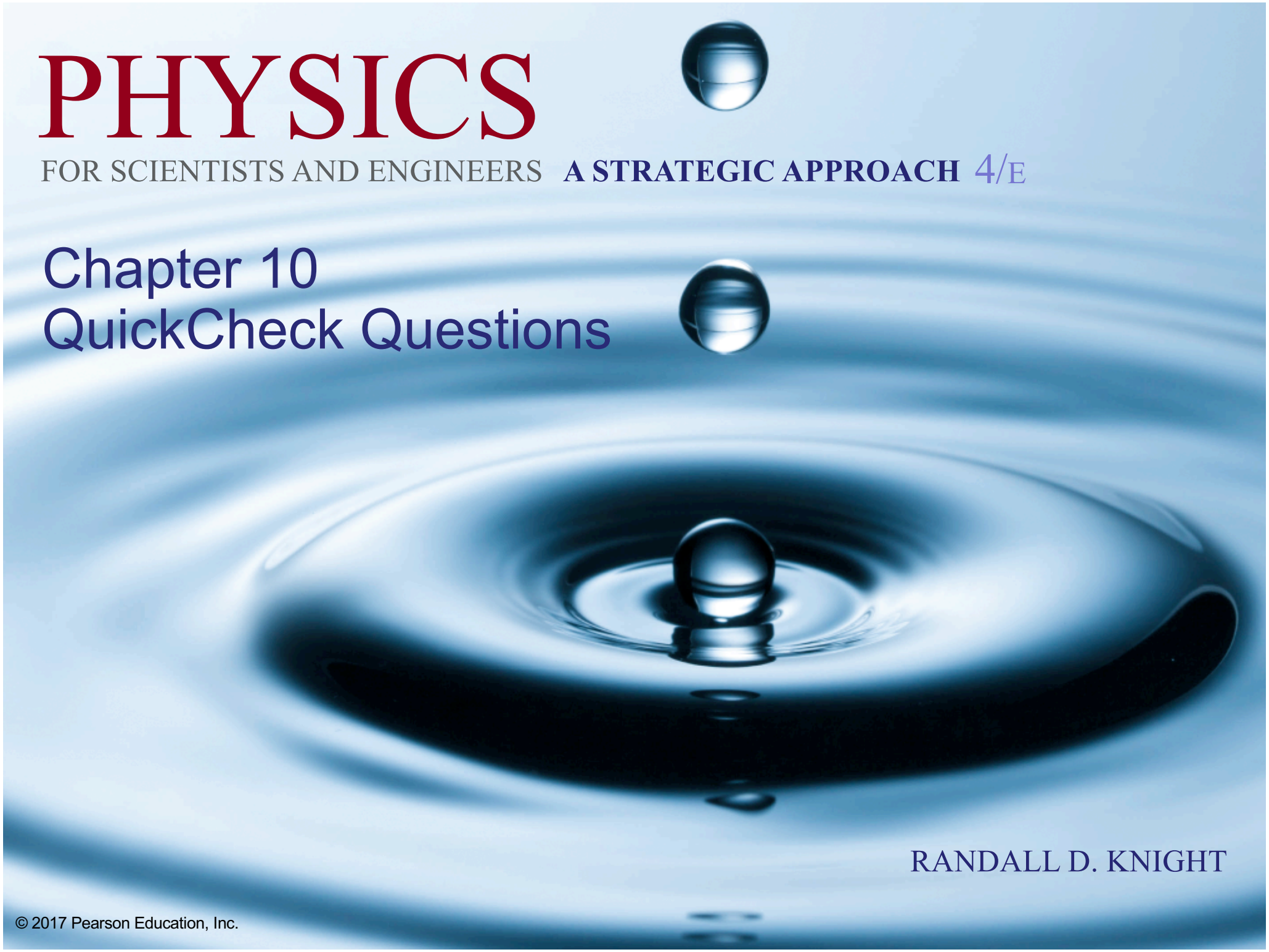
PHYSICS

FOR SCIENTISTS AND ENGINEERS **A STRATEGIC APPROACH** 4/E

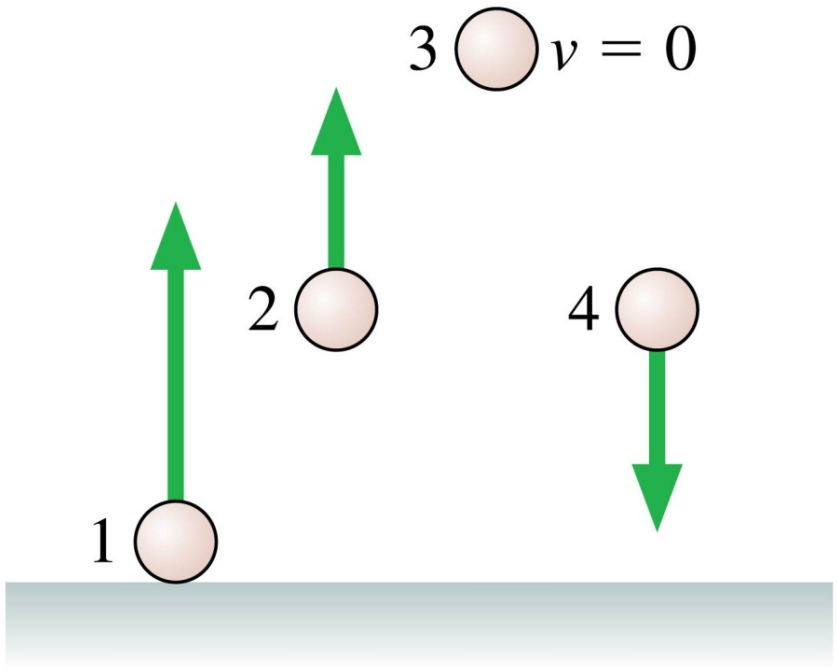
Chapter 10
QuickCheck Questions



RANDALL D. KNIGHT

QuickCheck 10.1

Rank in order, from largest to smallest, the gravitational potential energies of the balls.



A. $1 > 2 = 4 > 3$

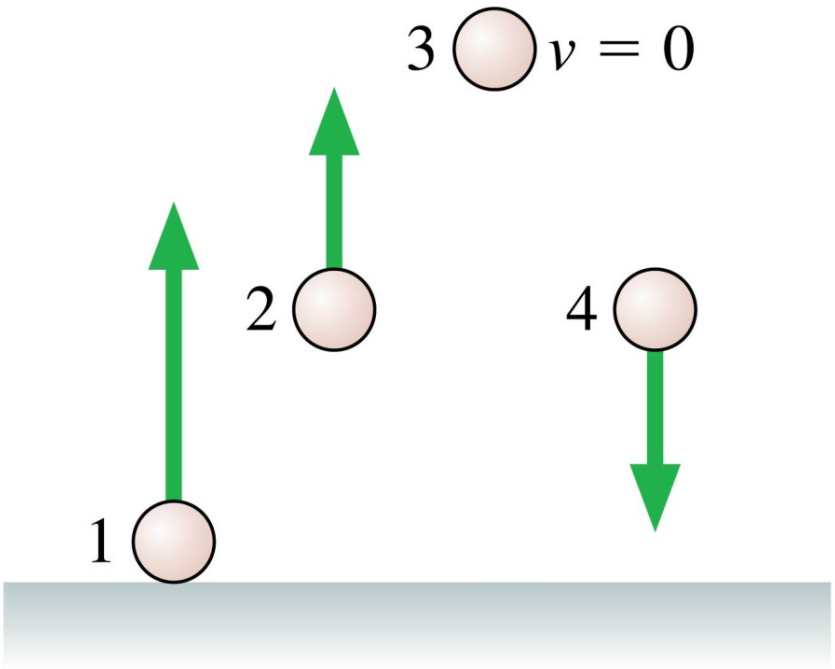
B. $1 > 2 > 3 > 4$

C. $3 > 2 > 4 > 1$

D. $3 > 2 = 4 > 1$

QuickCheck 10.1

Rank in order, from largest to smallest, the gravitational potential energies of the balls.



A. $1 > 2 = 4 > 3$

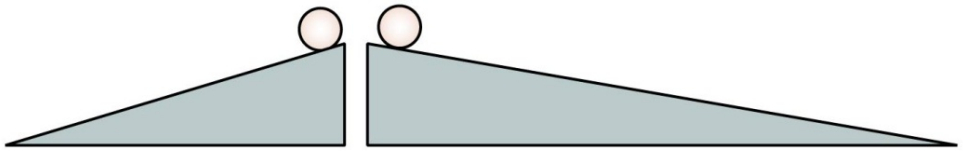
B. $1 > 2 > 3 > 4$

C. $3 > 2 > 4 > 1$

✔ **D. $3 > 2 = 4 > 1$**

QuickCheck 10.2

Starting from rest, a marble first rolls down a steeper hill, then down a less steep hill of the same height. For which is it going faster at the bottom?



A. Faster at the bottom of the steeper hill.

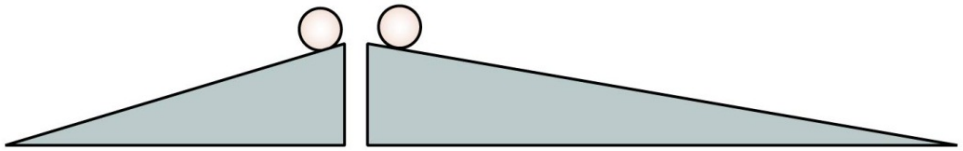
B. Faster at the bottom of the less steep hill.

C. Same speed at the bottom of both hills.

D. Can't say without knowing the mass of the marble.

QuickCheck 10.2

Starting from rest, a marble first rolls down a steeper hill, then down a less steep hill of the same height. For which is it going faster at the bottom?



A. Faster at the bottom of the steeper hill.

B. Faster at the bottom of the less steep hill.

✔ **C. Same speed at the bottom of both hills.**

D. Can't say without knowing the mass of the marble.

QuickCheck 10.3

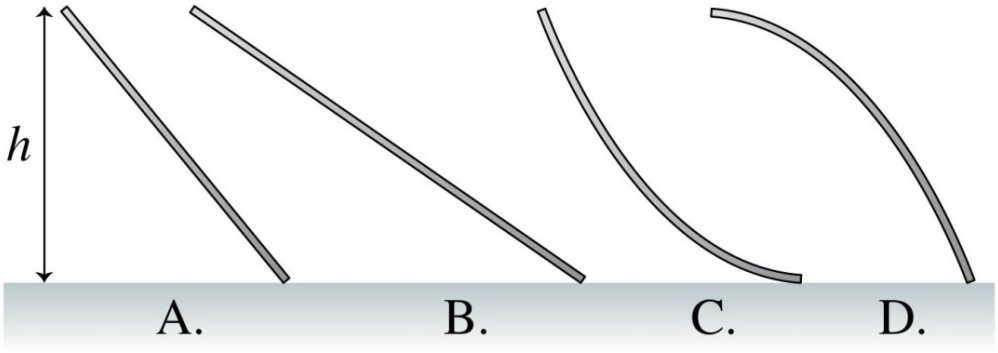
A small child slides down the four frictionless slides A–D. Rank in order, from largest to smallest, her speeds at the bottom.

A. $v_D > v_A > v_B > v_C$

B. $v_D > v_A = v_B > v_C$

C. $v_C > v_A > v_B > v_D$

D. $v_A = v_B = v_C = v_D$



QuickCheck 10.3

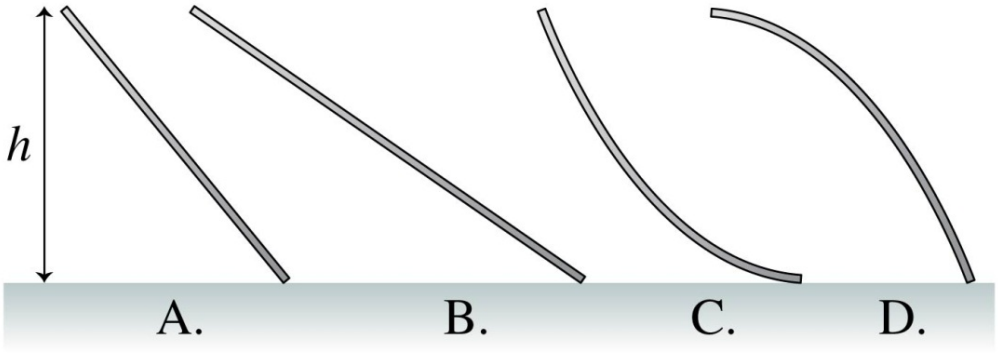
A small child slides down the four frictionless slides A–D. Rank in order, from largest to smallest, her speeds at the bottom.

A. $v_D > v_A > v_B > v_C$

B. $v_D > v_A = v_B > v_C$

C. $v_C > v_A > v_B > v_D$

✔ **D. $v_A = v_B = v_C = v_D$**



QuickCheck 10.4

A child is on a playground swing, motionless at the highest point of his arc. What energy transformation takes place as he swings back down to the lowest point of his motion?

A. $K \rightarrow U_{\mathrm{G}}$

B. $U_{\mathrm{G}} \rightarrow K$

C. $E_{\mathrm{th}} \rightarrow K$

D. $U_{\mathrm{G}} \rightarrow E_{\mathrm{th}}$

E. $K \rightarrow E_{\mathrm{th}}$

QuickCheck 10.4

A child is on a playground swing, motionless at the highest point of his arc. What energy transformation takes place as he swings back down to the lowest point of his motion?

A. $K \rightarrow U_G$

✔ **B. $U_G \rightarrow K$**

C. $E_{th} \rightarrow K$

D. $U_G \rightarrow E_{th}$

E. $K \rightarrow E_{th}$

QuickCheck 10.5

A skier is gliding down a gentle slope at a constant speed. What energy transformation is taking place?

A. $K \rightarrow U_{\mathrm{G}}$

B. $U_{\mathrm{G}} \rightarrow K$

C. $E_{\mathrm{th}} \rightarrow K$

D. $U_{\mathrm{G}} \rightarrow E_{\mathrm{th}}$

E. $K \rightarrow E_{\mathrm{th}}$

QuickCheck 10.5

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A. $K \rightarrow U_{\mathrm{G}}$

B. $U_{\mathrm{G}} \rightarrow K$

C. $E_{\mathrm{th}} \rightarrow K$

✔ **D.** $\boldsymbol{U_{\mathrm{G}} \rightarrow E_{\mathrm{th}}}$

E. $K \rightarrow E_{\mathrm{th}}$

QuickCheck 10.6

A spring-loaded gun shoots a plastic ball with a launch speed of 2.0 m/s. If the spring is compressed twice as far, the ball's launch speed will be

A. 1.0 m/s
B. 2.0 m/s
C. 2.8 m/s
D. 4.0 m/s
E. 16.0 m/s

QuickCheck 10.6

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A. 1.0 m/s
B. 2.0 m/s
C. 2.8 m/s
✔ **D. 4.0 m/s**
E. 16.0 m/s

Conservation of energy: $\frac{1}{2}mv^2 = \frac{1}{2}k(\Delta x)^2$

Double $\Delta x \rightarrow$ double v

QuickCheck 10.7

A spring-loaded gun shoots a plastic ball with a launch speed of 2.0 m/s. If the spring is replaced with a new spring having twice the spring constant (but still compressed the same distance), the ball's launch speed will be

A. 1.0 m/s
B. 2.0 m/s
C. 2.8 m/s
D. 4.0 m/s
E. 16.0 m/s

QuickCheck 10.7

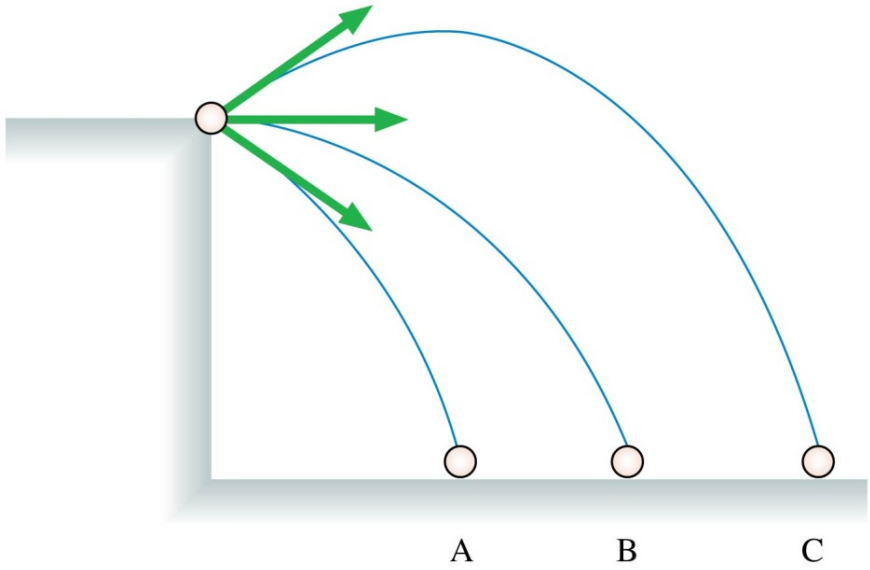
A spring-loaded gun shoots a plastic ball with a launch speed of 2.0 m/s. If the spring is replaced with a new spring having twice the spring constant (but still compressed the same distance), the ball's launch speed will be

A. 1.0 m/s
B. 2.0 m/s
✔ **C. 2.8 m/s**
D. 4.0 m/s
E. 16.0 m/s

Conservation of energy: $\frac{1}{2}mv^2 = \frac{1}{2}k(\Delta x)^2$
Double $k \rightarrow$ increase
v by square root of 2

QuickCheck 10.8

Three balls are thrown from a cliff with the same speed but at different angles. Which ball has the greatest speed just before it hits the ground?



A. Ball A

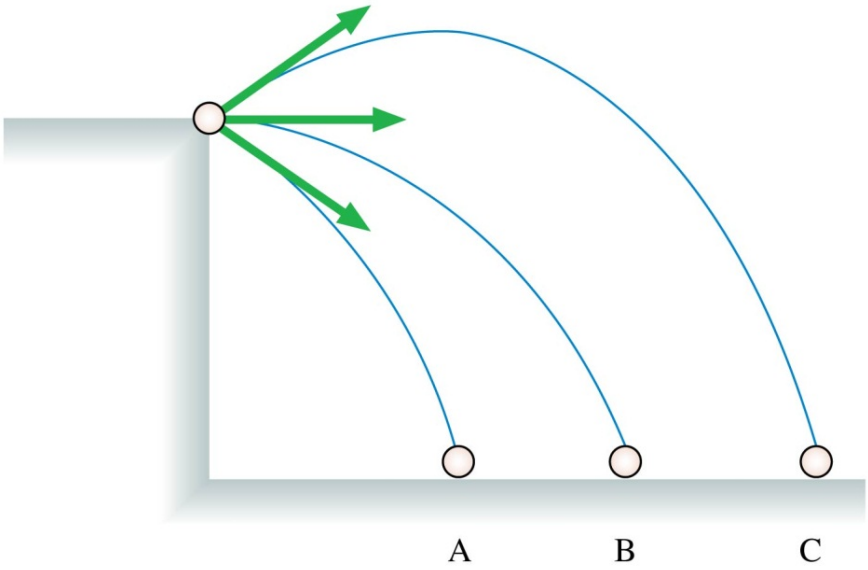
B. Ball B

C. Ball C

D. All balls have the same speed.

QuickCheck 10.8

Three balls are thrown from a cliff with the same speed but at different angles. Which ball has the greatest speed just before it hits the ground?



A. Ball A

B. Ball B

C. Ball C

✔ **D. All balls have the same speed.**

QuickCheck 10.9

A hockey puck sliding on smooth ice at $4\ \mathrm{m/s}$ comes to a 1-m-high hill. Will it make it to the top of the hill?

A. Yes

B. No

C. Can't answer without knowing the mass of the puck.

D. Can't say without knowing the angle of the hill.

QuickCheck 10.9

A hockey puck sliding on smooth ice at $4\ \mathrm{m/s}$ comes to a 1-m-high hill. Will it make it to the top of the hill?

A. Yes

✔ **B. No**

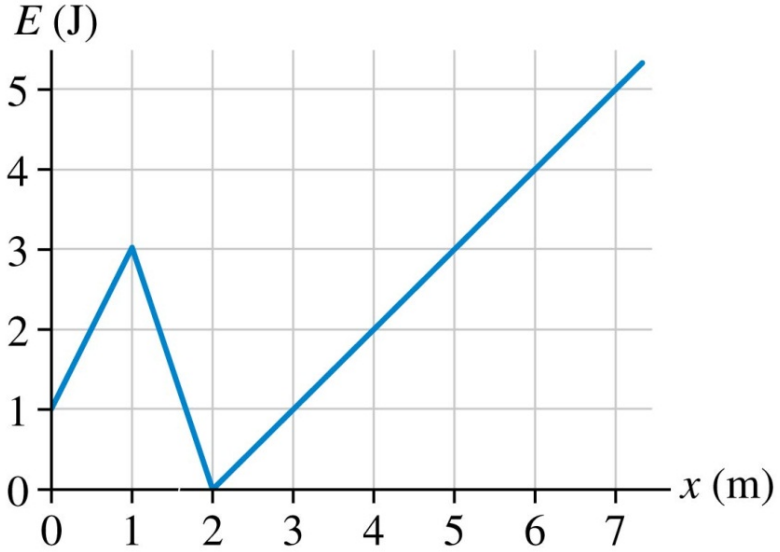
$$\frac{1}{2}mv^2 = mgy \text{ requires } v^2 = 2gy \approx 20\ \mathrm{m^2/s^2}$$

C. Can't answer without knowing the mass of the puck.

D. Can't say without knowing the angle of the hill.

QuickCheck 10.10

A particle with the potential energy shown is moving to the right. It has 1.0 J of kinetic energy at $x = 1.0$ m. In the region $1.0\text{ m} < x < 2.0\text{ m}$, the particle is



A. Speeding up.

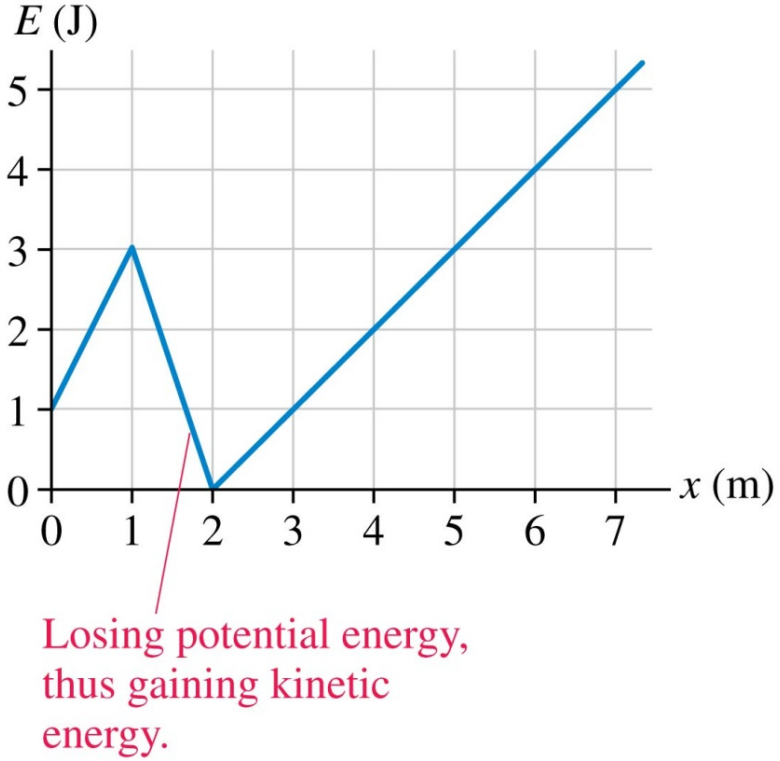
B. Slowing down.

C. Moving at constant speed.

D. I have no idea.

QuickCheck 10.10

A particle with the potential energy shown is moving to the right. It has 1.0 J of kinetic energy at $x = 1.0$ m. In the region $1.0\text{ m} < x < 2.0\text{ m}$, the particle is



✔ A. **Speeding up.**

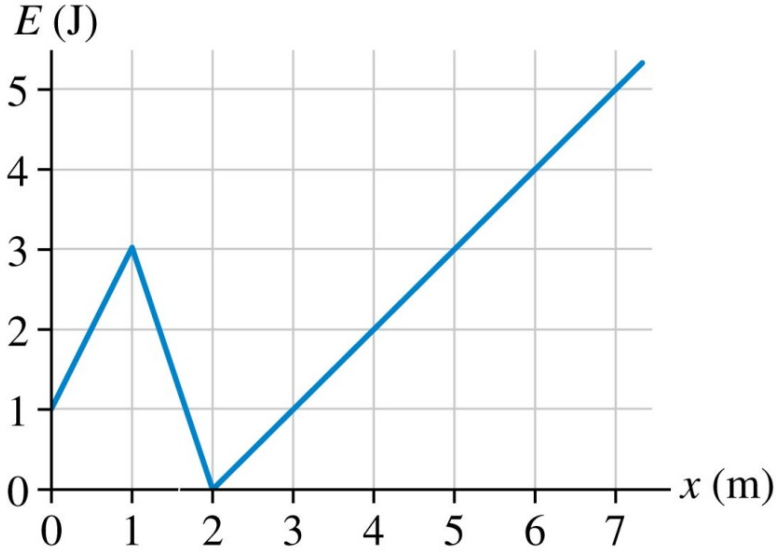
B. Slowing down.

C. Moving at constant speed.

D. I have no idea.

QuickCheck 10.11

A particle with the potential energy shown is moving to the right. It has $1.0\ \text{J}$ of kinetic energy at $x = 1.0\ \text{m}$. Where is the particle's turning point?



A. $1.0\ \text{m}$

B. $2.0\ \text{m}$

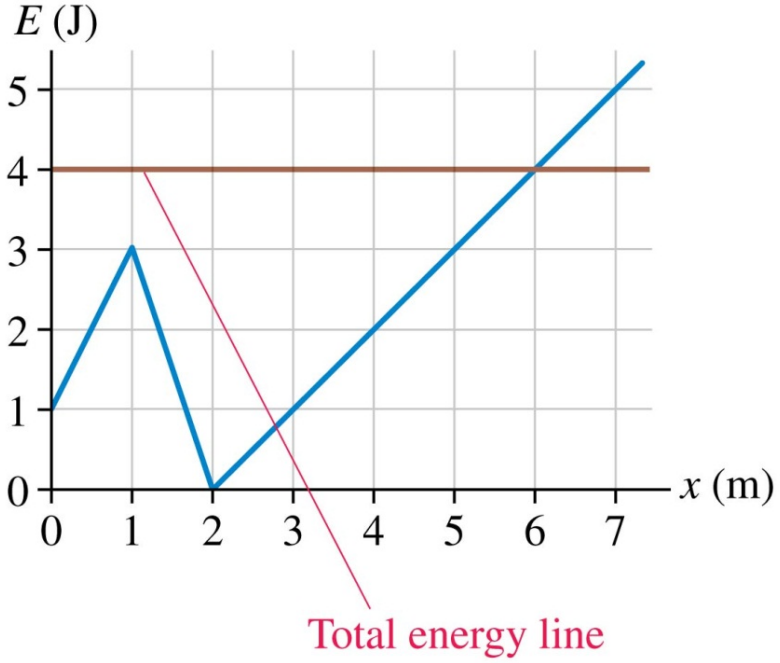
C. $5.0\ \text{m}$

D. $6.0\ \text{m}$

E. It doesn't have a turning point.

QuickCheck 10.11

A particle with the potential energy shown is moving to the right. It has $1.0\ \text{J}$ of kinetic energy at $x = 1.0\ \text{m}$. Where is the particle's turning point?



A. $1.0\ \text{m}$

B. $2.0\ \text{m}$

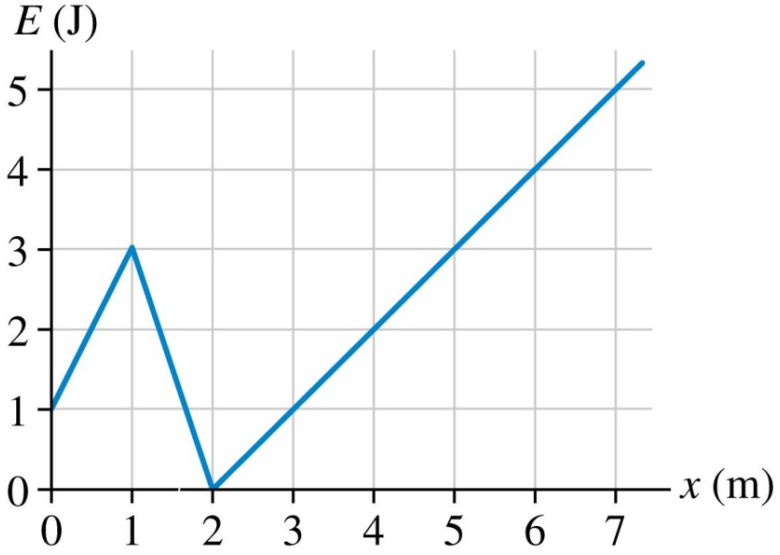
C. $5.0\ \text{m}$

✔ **D. $6.0\ \text{m}$**

E. It doesn't have a turning point.

QuickCheck 10.12

A particle with this potential energy could be in stable equilibrium at $x =$

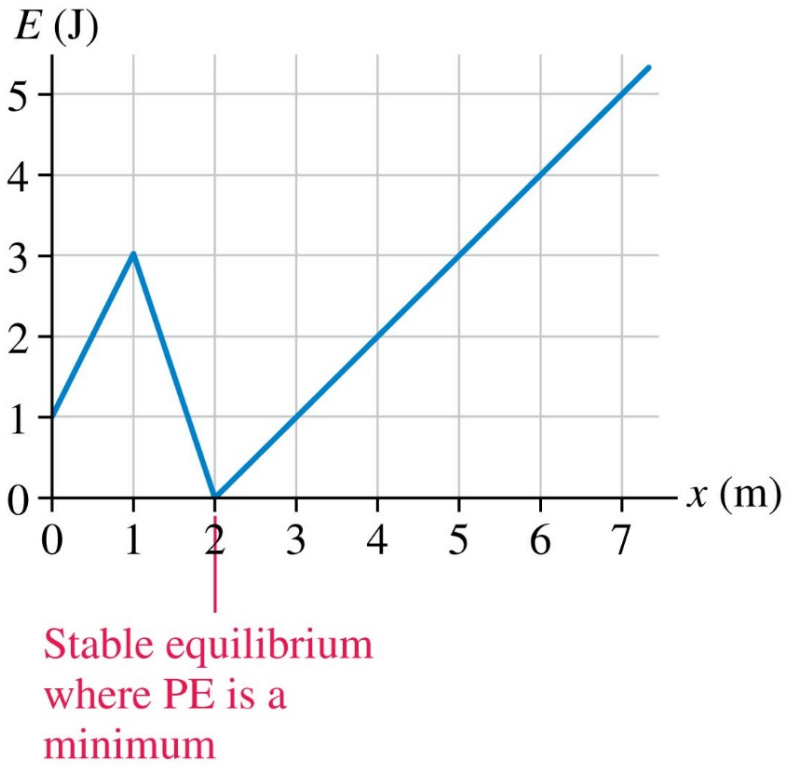


A. 0.0 m
B. 1.0 m
C. 2.0 m
D. Either A or C
E. Either B or C

QuickCheck 10.12

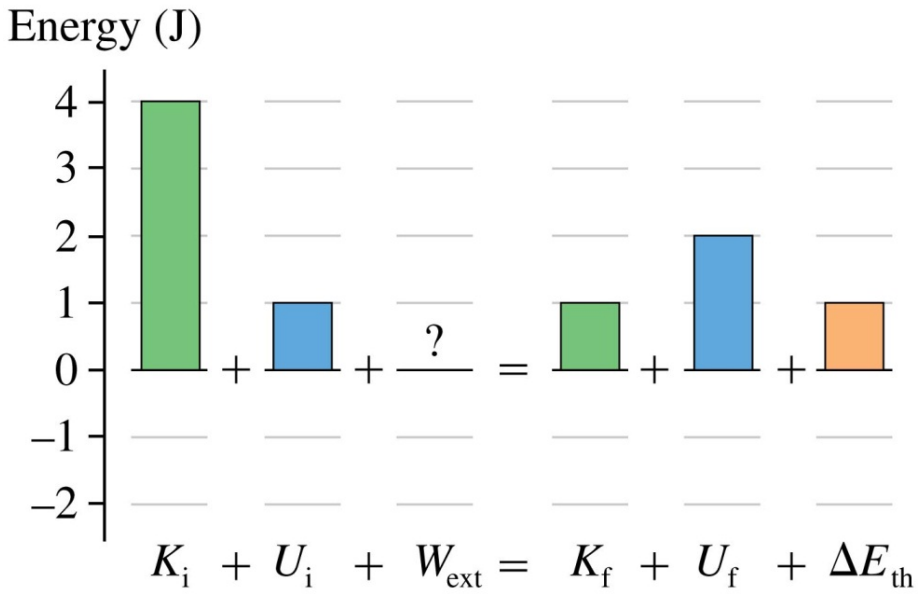
A particle with this potential energy could be in stable equilibrium at $x =$

A. 0.0 m
B. 1.0 m
✔ **C. 2.0 m**
D. Either A or C.
E. Either B or C.



QuickCheck 10.13

How much work is done by the environment in the process represented by the energy bar chart?



A. –2 J

B. –1 J

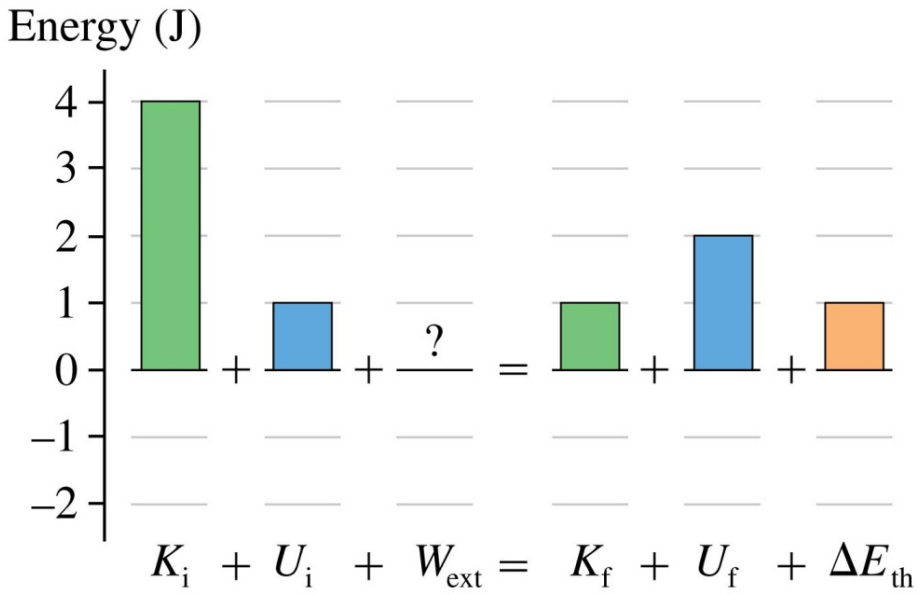
C. 0 J

D. 1 J

E. 2 J

QuickCheck 10.13

How much work is done by the environment in the process represented by the energy bar chart?



A. –2 J

✔ **B. –1 J**

C. 0 J

D. 1 J

E. 2 J

The system started with 5 J but ends with 4 J. 1 J must have been transferred from the system to the environment as work.