Energy Skate Park 4

Learning Goals:

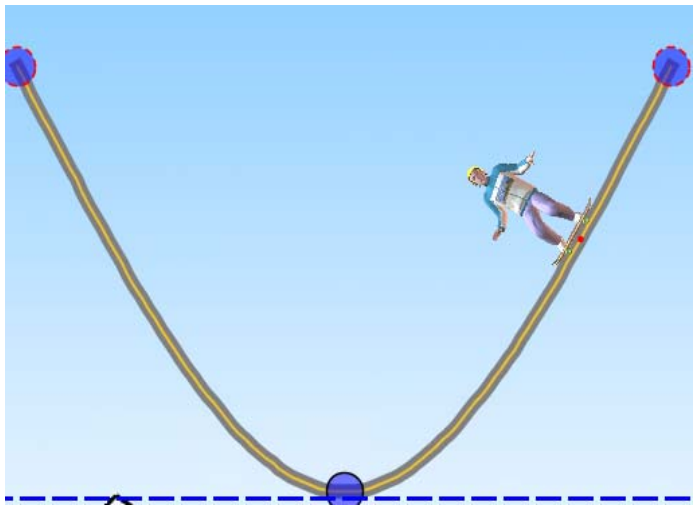
Students will be able to use **Energy-Time** graphs to… at a given time.

- Estimate a location for the Skater on a track.
- Calculate the speed or height of the Skater *Friction and frictionless.*
- Predict energy distribution for tracks with and without friction.

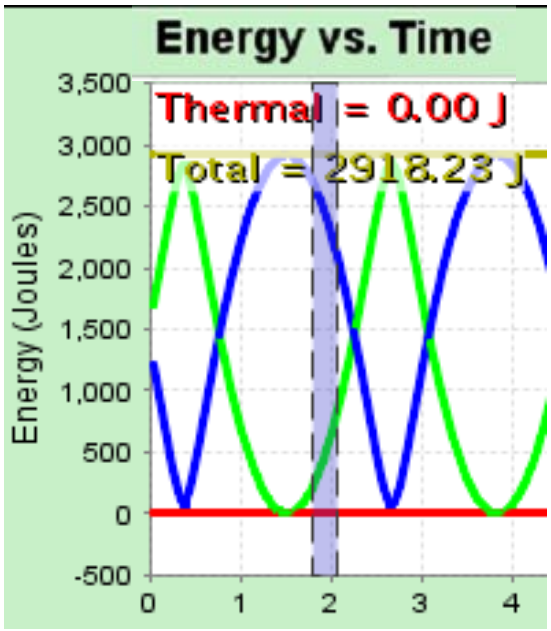
By Trish Loeblein updated July 2008

The Friction concepts are not addressed in these clicker questions. Some screen images are included, but it would be better to have the sim running. I have used tracks that are the default or under Track menu for easy reproduction.

1. What will the speed of the 75kg Skater be at 2 seconds?



PE = 0 at dotted line



Total =2918 J

KE=509 J

PE=2408 J

A. 14m/s B. 8.8m/s C. 8.0m/s D. 3.7m/s

Comments for question 1: This is the default track with the PE line moved up to the track

KE= $1/2mv^2$

$509=1/2*75*\ v^2$

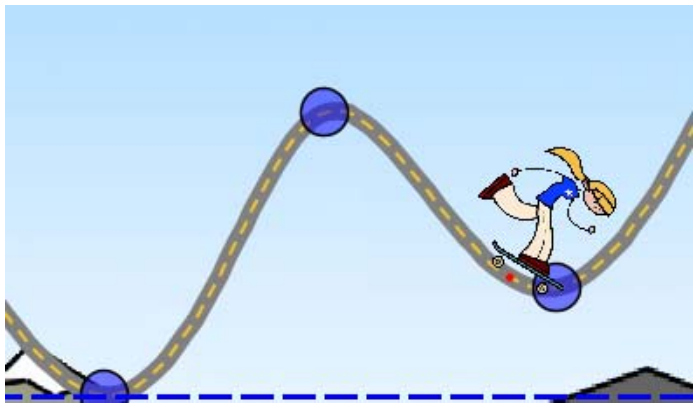
$$v = \sqrt{\frac{509*2}{75}} = 3.7 m/s$$

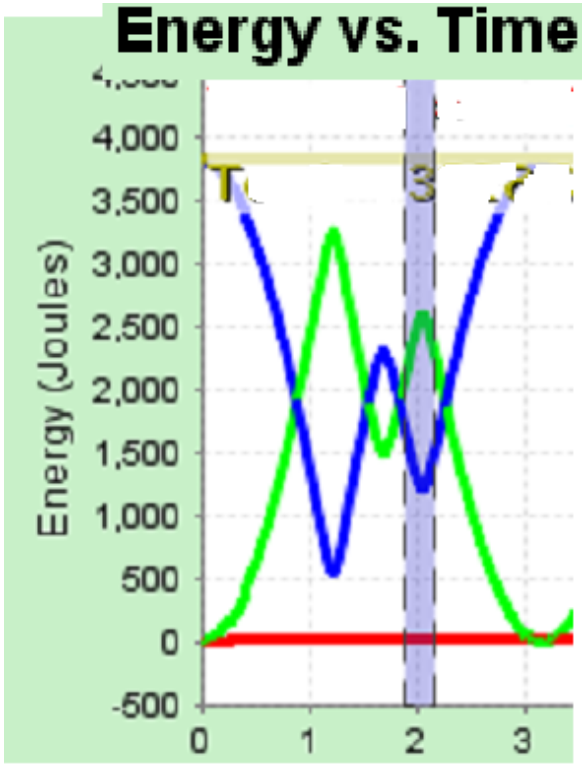
14 is no sqrt

8 uses PE

8.8 uses Total E

2. At what height is the 60kg Skater at 2 seconds?





Total =3829 J

KE=2429 J

PE=1365 J

A. 6.5m B. 4.2m C. 2.3m D. 1.9m

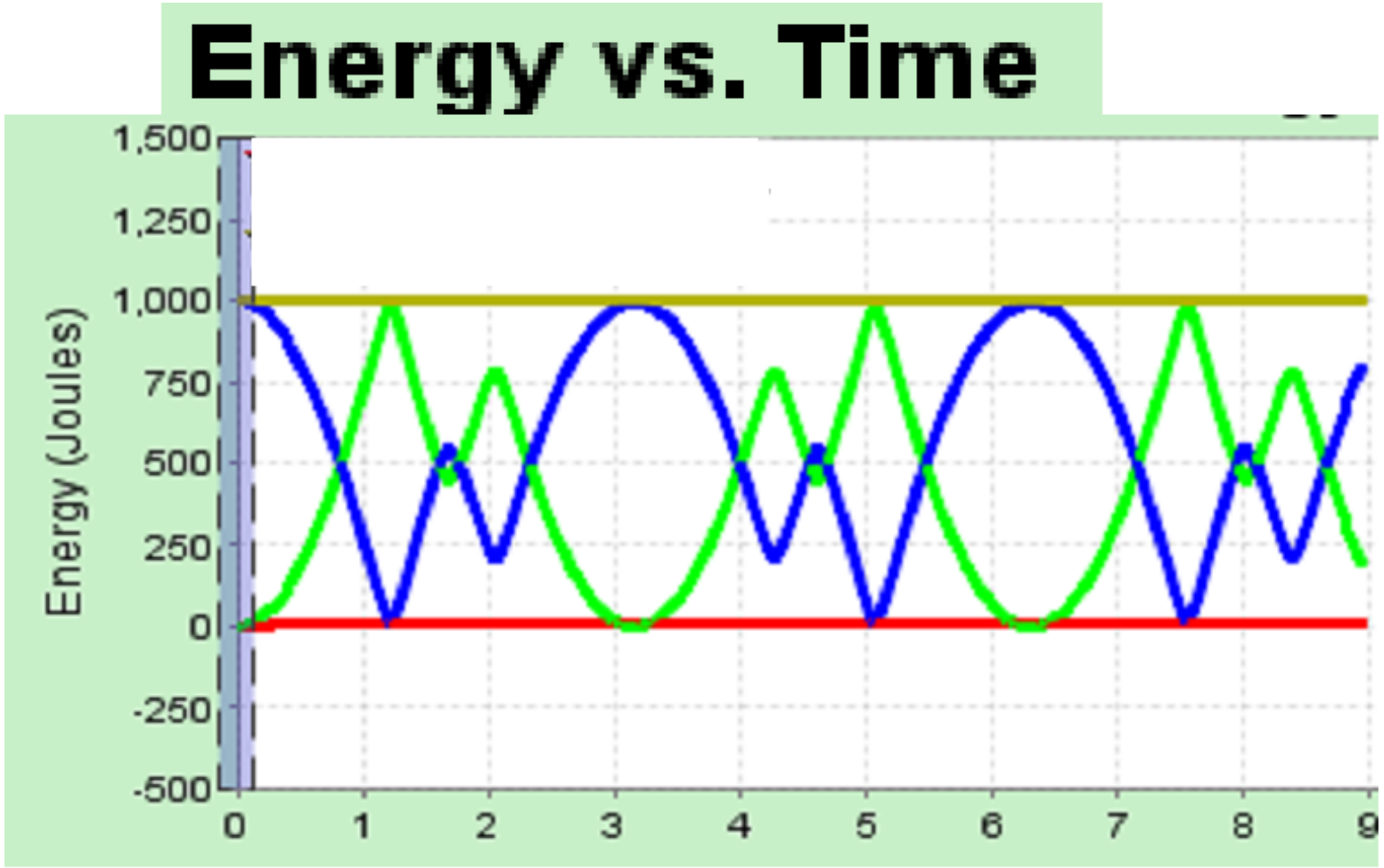
Comments for question 2: I used the Double well roller coaster track with the Skater changed to the girl and I moved the PE line to the bottom of the first well. Then I started from the “Return Skater” position.

Comments about #3. I would show the slide, have the students make a drawing and then show the options on the next slide.

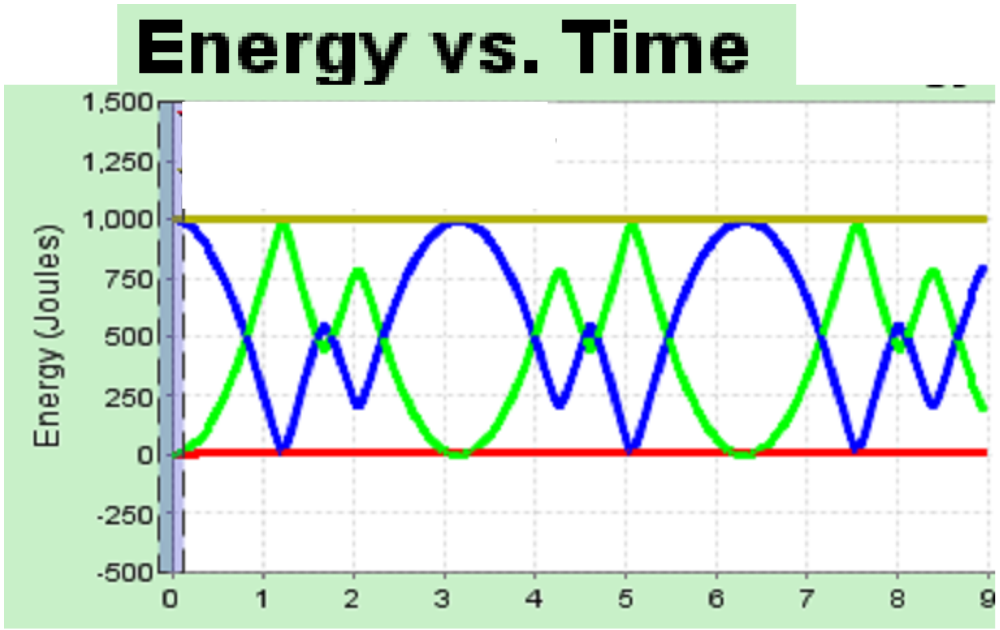
$$h = \frac{PE}{mg} = \frac{1365}{60 * 9.81} = 2.3m$$

6.5 uses Total E, 4.2 uses KE, 1.9 uses mass of 75,

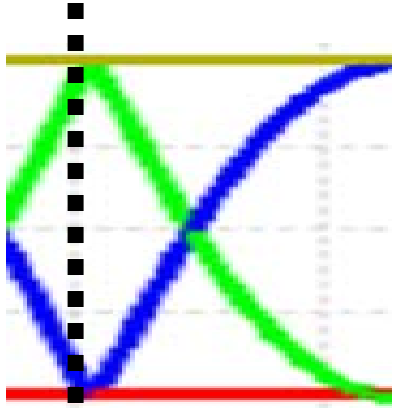
3. Draw what you think the energy graph look like at 10 seconds.



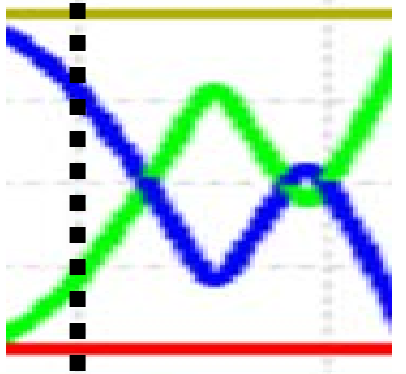
3. The energy graph at 10 s:



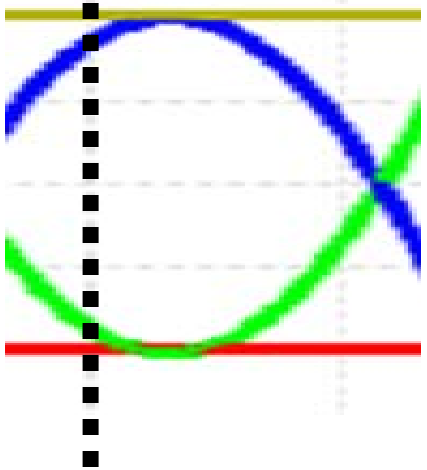
A



B

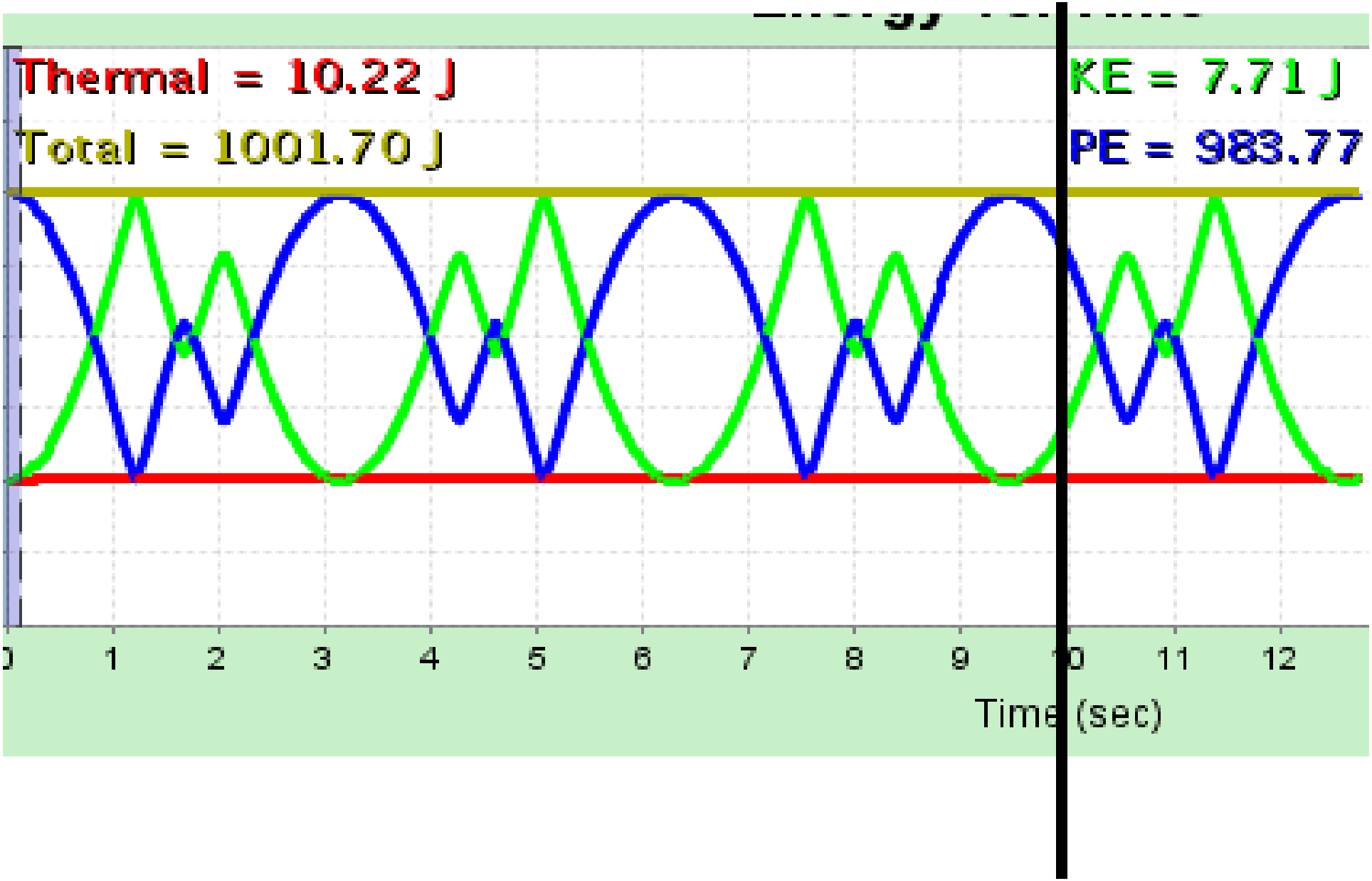


C

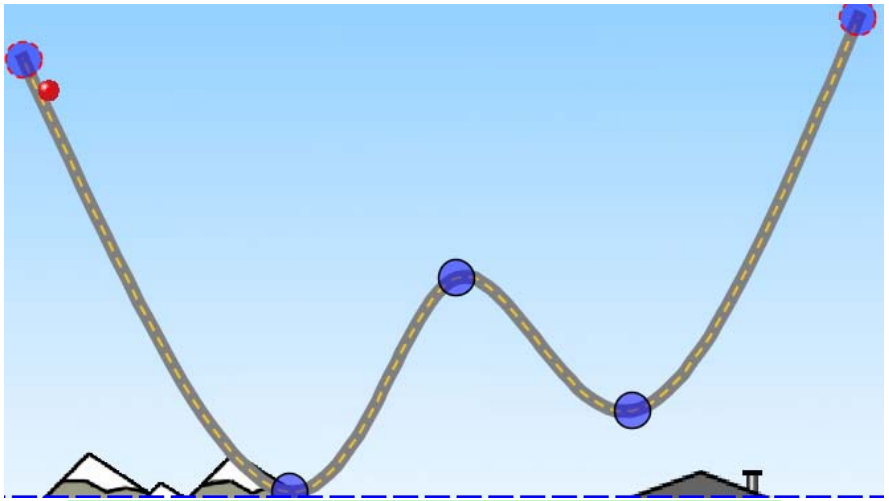


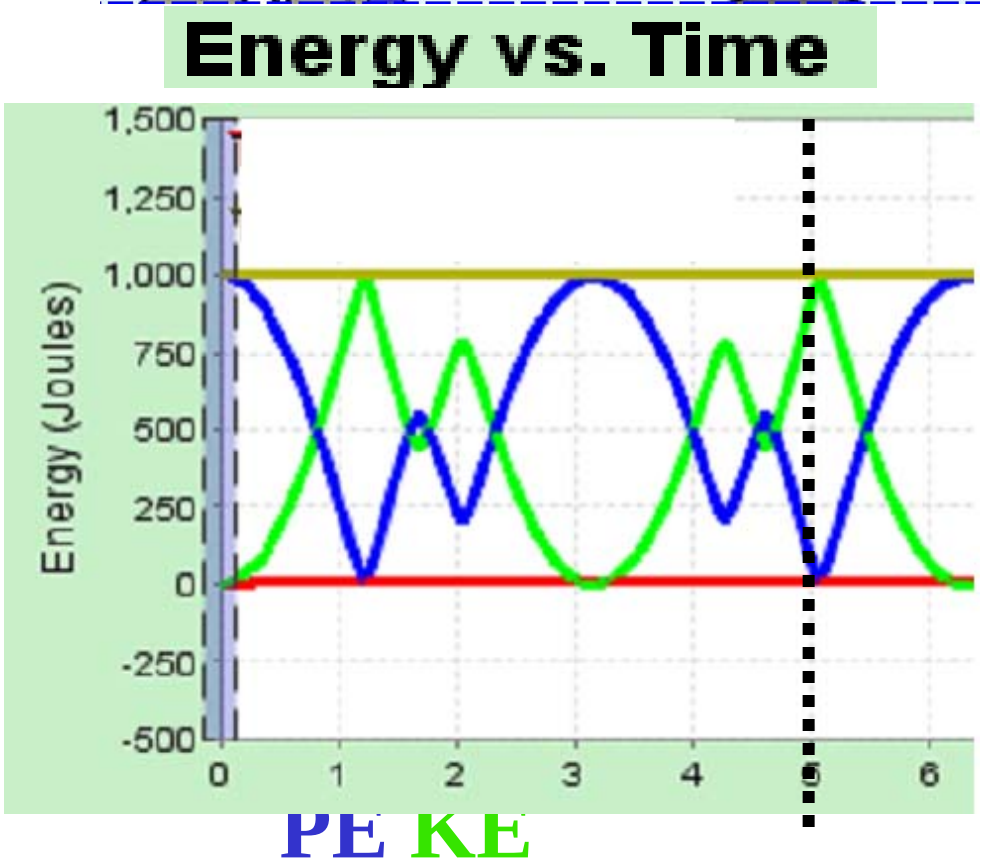
10

Comments and answer to 3: I used the double well roller coaster again with a ball at 18 kg for #3 and #4



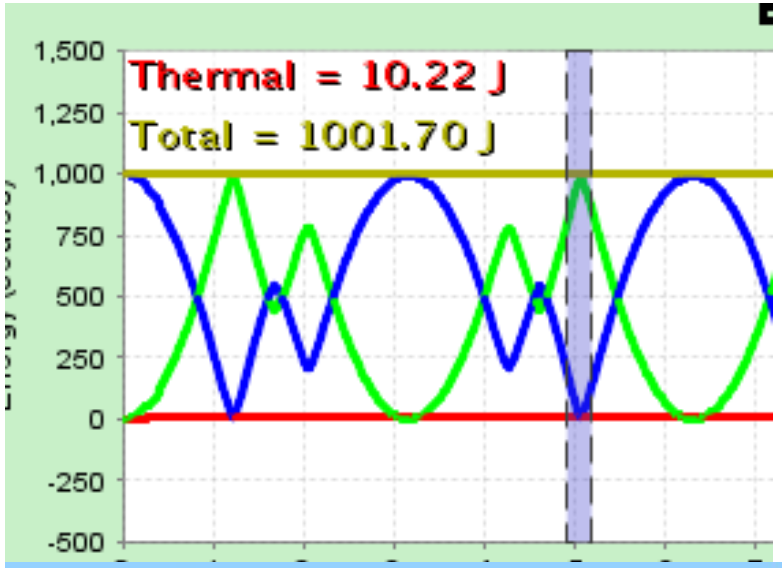
4. What might the ball be doing at 5 seconds?

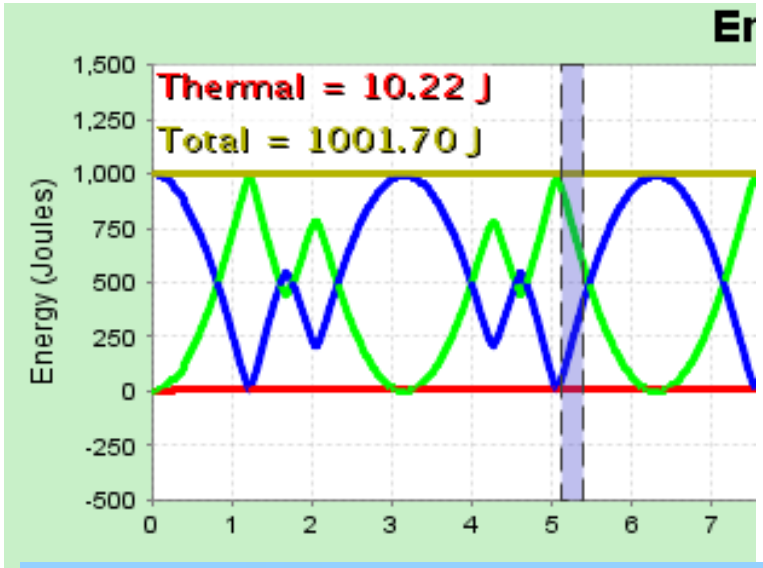




A. Going left to right at the lower dip
B. Going right to left at the lower dip
C. Going left to right at the higher dip
D. Going right to left at the higher dip

Answer to 4


Thermal = 10.22 J
Total = 1001.70 J
1,500
1,250
1,000
750
500
250
0
-250
-500


Thermal = 10.22 J
Total = 1001.70 J
Energy (Joules)
1,500
1,250
1,000
750
500
250
0
-250
-500
0
1
2
3
4
5
6
7