1. The figure gives the potential energy function of a particle.

Question 1

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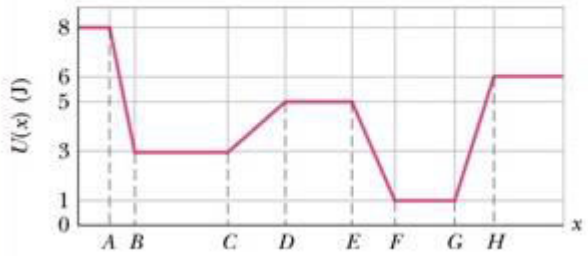
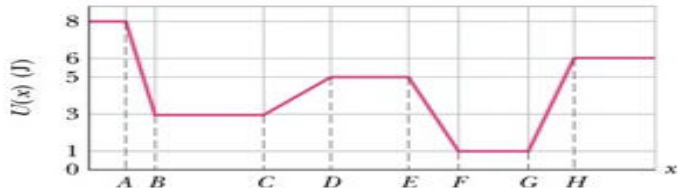


Rank regions AB, BC, CD, and DE according to the magnitude of the force on the particle, greatest first. If multiple regions rank equally, use the same rank for each, then exclude the intermediate ranking (i.e. if objects A, B, and C must be ranked, and A and B must both be ranked first, the ranking would be A:1, B:1, C:3). If all regions rank equally, rank each as '1'.



AB 1

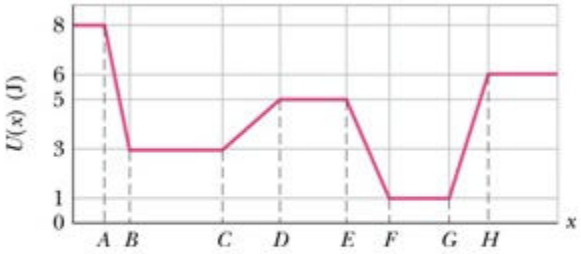
BC 3

CD 2

DE 3

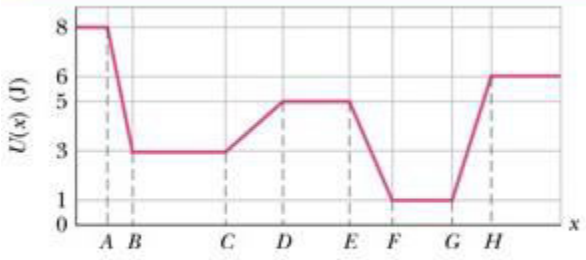
1. Greatest
2. Second greatest
3. Third greatest
4. Fourth greatest

What value must the mechanical energy E_{mec} of the particle not exceed if the particle is to be trapped in the potential well at the left?



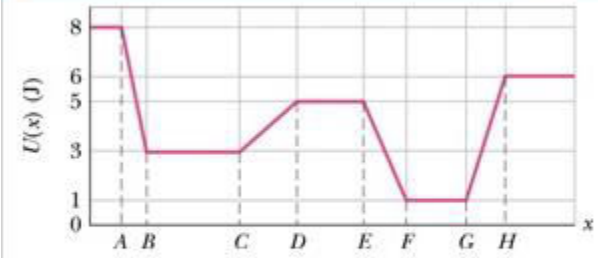
5 J

What value must the mechanical energy E_{mec} of the particle not exceed if the particle is to be trapped in the potential well at the right?



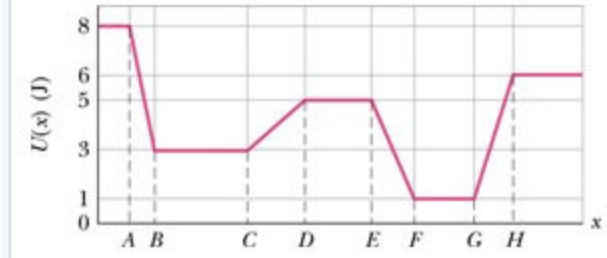
5 J

What value must the mechanical energy E_{mec} of the particle not exceed if the particle is to be able to move between the two potential wells but not to the right of point H?



6 J

For the situation of (d), in which of regions BC, DE, and FG will the particle have the greatest kinetic energy? (Several choices may be correct.)



- [x] FG
- [ ] BC
- [ ] DE

For the situation of (d), in which of regions BC, DE, and FG will the particle have the least speed? (Several choices may be correct.)

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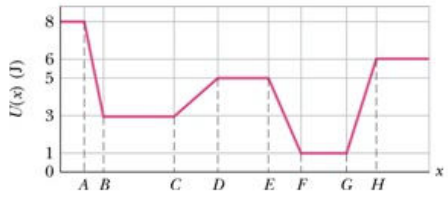
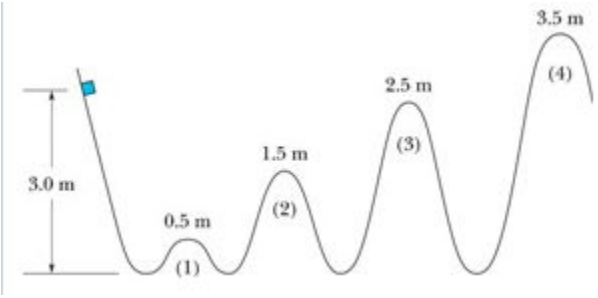


- [ ] BC
- [x] DE
- [ ] FG

2. In the figure, a small, initially stationary block is released on a frictionless ramp at a height of 3.0 m. Hill heights along the ramp are as shown. The hills have identical circular tops, and the block does not fly off any hill.



Which hill is the first the block cannot cross?

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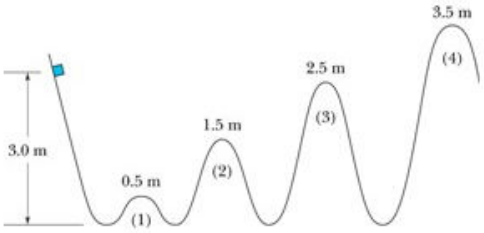

- [x] Hill 4
- [ ] Hill 3
- [ ] Hill 1
- [ ] Hill 2

What does the block do after failing to cross that hill?

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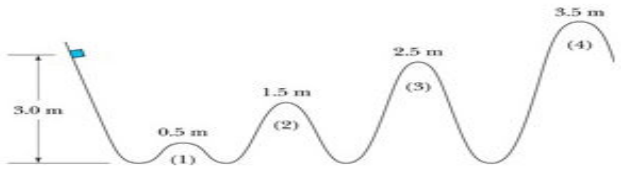

- Stops in place.
- Stops between Hill 2 and Hill 3.
- Oscillates back and forth between Hill 3 and Hill 4.
- Returns to its starting point and repeats the trip.

On which hilltop is the centripetal acceleration of the block greatest?

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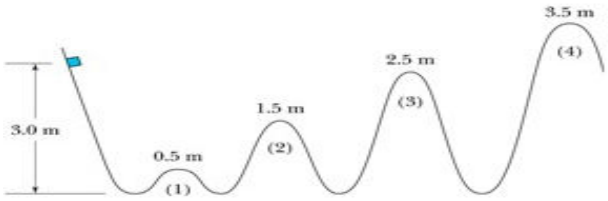

- Hill 2
- Hill 3
- Hill 4
- Hill 1

On which hilltop is the normal force on the block least?

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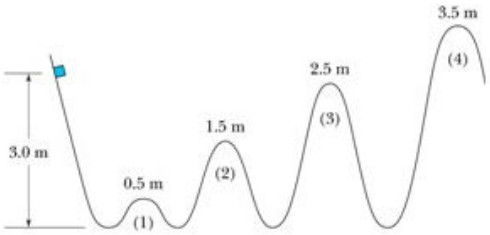
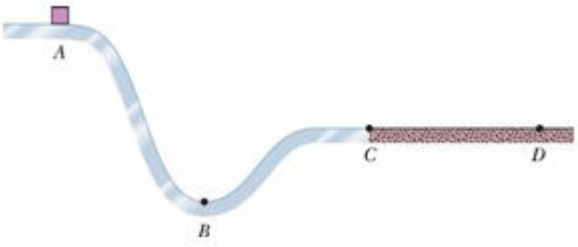
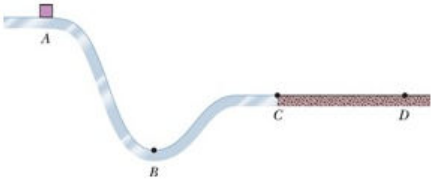


- Hill 2
- Hill 1
- Hill 3
- Hill 4

3. In the figure, a block slides from *A* to *C* along a frictionless ramp, and then it passes through horizontal region *CD*, where a frictional force acts on it.

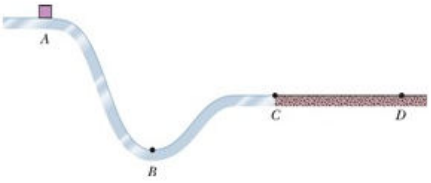


Is the block's kinetic energy increasing, decreasing, or constant in region *AB*?



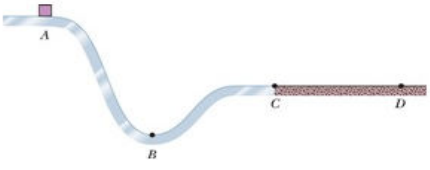
- (•) Increasing
- ( ) Constant
- ( ) Decreasing

Is the block's kinetic energy increasing, decreasing, or constant in region *BC*?



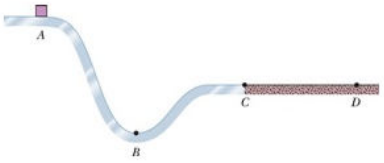
- ( ) Increasing
- ( ) Constant
- (•) Decreasing

Is the block's kinetic energy increasing, decreasing, or constant in region *CD*?



- (•) Decreasing
- ( ) Constant
- ( ) Increasing

Is the block's mechanical energy increasing, decreasing, or constant in those regions?



Region *AB* 3 ▾

Region *BC* 3 ▾

Region *CD* 2 ▾

1. Increasing
2. Decreasing
3. Constant

4. In Figure (*a*), you pull upward on a rope that is attached to a cylinder on a vertical rod. Because the cylinder fits tightly on the rod, the cylinder slides along the rod with considerable friction. Your force does work (W = + 100 J) on the cylinder–rod–Earth system (Figure (*b*)). An "energy statement" for the system is shown in Figure (*c*): the kinetic energy K increases by 50 J, and the gravitational potential energy U_g increases by 20 J.

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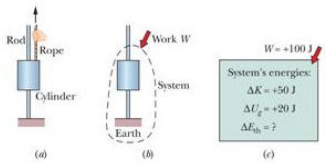

The only other change in energy within the system is for the thermal energy E_{th}. What is the change ΔE_{th}?

30 J

exact number, no tolerance

5. The figure shows three plums that are launched from the same level with the same speed. One moves straight upward, one is launched at a small angle to the vertical, and one is launched along a frictionless incline. Rank the plums according to their speed when they reach the level of the dashed line, greatest first.

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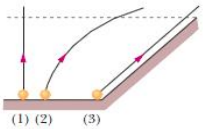

- 1, 2, 3.
- 2, 1, 3.
- 3, 2, 1.
- 2, 3, 1.
- (●) All plums have the same speed.
- 3, 1, 2.
- 1, 3, 2.