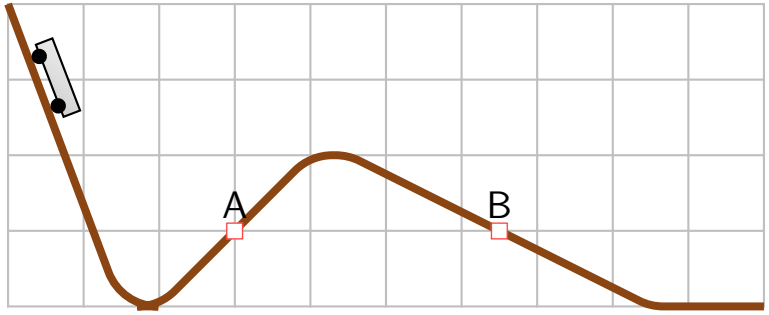
Question 1

A cart is released at the indicated point on the illustrated frictionless track; air resistance is negligible. The cart can easily pass the bends in the track.

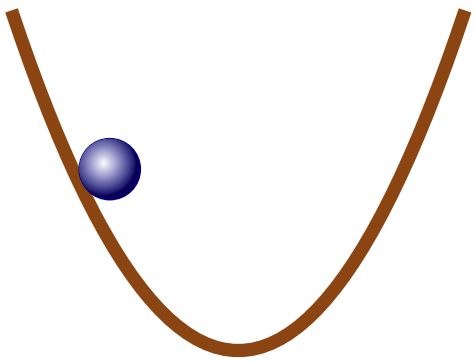


Which of the following is true?

1. The speed of the cart at B is the same as at A.
2. The speed of the cart at B is larger than at A.
3. The speed of the cart at B is smaller than at A.
4. The speed of the cart at B could be smaller, larger or the same as at A. This depends on the height and shape of the bump.

Question 2

A ball rolls along a track as illustrated. The ball is subject to friction and air resistance.



Which of the following is true?

1. As the ball rolls down, PE is converted into KE only.
2. As the ball rolls down, KE is converted into PE and ThermE.
3. As the ball rolls down, PE is converted into KE and ThermE.
4. As the ball rolls down, ThermE is converted into KE only.
5. As the ball rolls down, ThermE and PE are converted into KE only.

Question 3

The energy flows in three engines are as follows.

Engine	Input	Waste	Useful Output
A	1000 J	700 J	300 J
B	1000 J	900 J	100 J
C	100 J	60 J	40 J

Which of the following ranks these in order of efficiency?

1. A largest, B middle, C smallest.
2. A largest, C middle, B smallest.
3. C largest, A middle, B smallest.
4. C largest, B middle, A smallest.
5. B largest, A middle, C smallest.

Question 4

Three charged particles are situated as illustrated. The sizes of the charges are all the same.

Various charged particles can be placed in the middle. Which (choose one) of the following is true regarding the net force on the middle charge?

1. The net force is repulsive if the middle charge is negative and attractive if it is positive.
2. The net force is zero if the middle charge is negative and repulsive if it is positive.
3. The net force is zero if the middle charge is positive and attractive if it is negative.
4. The net force is zero regardless of the middle charge.

Question 5

Three electrical wires carry currents. The charge flowing through each wire is observed for different times and the data is:

Wire	Charge	Time Observed
A	$30\,\mathrm{C}$	$3\,\mathrm{s}$
B	$30\,\mathrm{C}$	$6\,\mathrm{s}$
C	$24\,\mathrm{C}$	$2\,\mathrm{J}$

Which of the following ranks the currents correctly?

1. A and B same, C smaller.
2. A and B same, C larger.
3. A largest, B middle, C smallest.
4. C largest, A middle, B smallest.