Answer on Question #41352- Physics - Other

Question.

Which of the following is CORRECT about the motion of a simple pendulum?

- the kinetic energy is zero at the maximum displacement from the equilibrium position
- the kinetic energy is zero at the maximum displacement from equilibrium position
- the velocity is maximum as it passes the equilibrium position
- the acceleration is zero at the maximum displacement from the equilibrium position

Solution.

This figure describes the motion of the pendulum in the gravitational field:

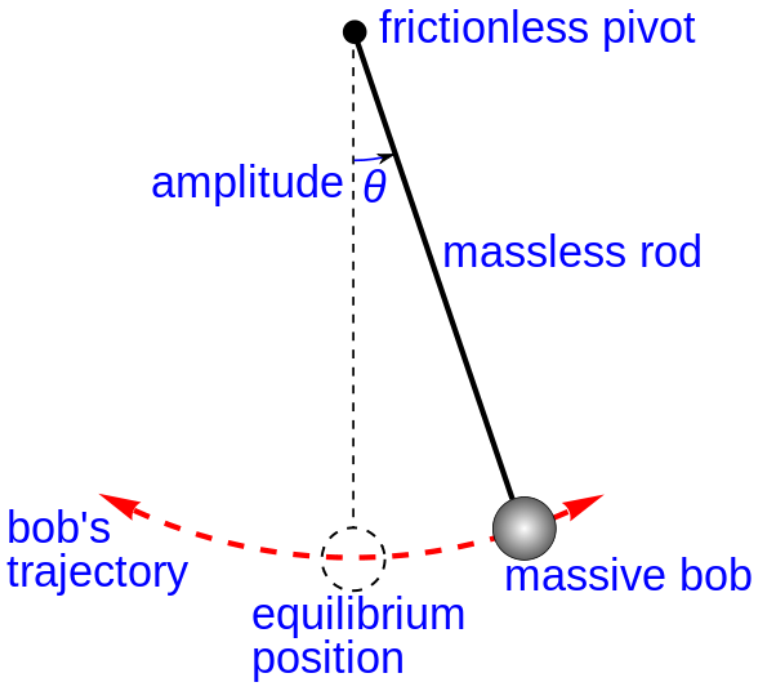

Fig.1. Motion of pendulum.

Total energy E is constant. It's sum of kinetic and potential energies:

$$E = K + U = const$$

Acceleration is always directed toward the equilibrium position. So, it's maximum at the maximum displacement from the equilibrium position.

Bob stops at the maximum displacement from the equilibrium position. So, velocity is zero at the maximum displacement and maximum as it passes the equilibrium position.

Kinetic energy is $K = \frac{1}{2}mv^2$, so kinetic energy is zero at the maximum displacement and maximum as it passes the equilibrium position too. Potential energy is conversely, because $U = E - K$.

Thus, to answer on your question made the following table:

Position	Amplitude	Velocity, v	Acceleration, a	Kinetic energy, $K = \frac{1}{2}mv^2$	Potential energy, $U = E - K$
equilibrium	0	max	0	max $K = E$	0
maximum displacement	max	0	max	0	max $U = E$

Answer.

The following statements about the motion of a simple pendulum are correct:

- the kinetic energy is zero at the maximum displacement from the equilibrium position
- the velocity is maximum as it passes the equilibrium position