(c) If $\sqrt{2gl} < v_B < \sqrt{5gl}$

In this case particle will not follow circular motion. Tension in string becomes zero somewhere between points C & A, whereas velocity remains positive. Particle leaves circular path and follow parabolic trajectory

(d) If $v_B = \sqrt{2gl}$

In this case both velocity and tension in the string becomes zero between B and C and particle will oscillate along semi-circular path.

(e) If $v_B < \sqrt{2gl}$

The velocity of particle remains zero between B and C but tension will not be zero and the particle will oscillate about the point B.

Vertical Motion of a Particle Attached with a **Light Rod:**

Since the rod does not get slack (there is no condition on tension of the rod), at the highest point is minimum velocity may be zero.

Then the critical velocity at the highest point is

$$v_A^{min} = 0$$

The critical velocity at the lowest point is

$$v_B^{min} = 2\sqrt{gl}$$

And the critical velocity at the lowest point is

$$v_B^{min} = \sqrt{2gl}$$