

# HW #27

CID 6265

① No, it does not, due to the centrifugal force. Centrifugal force is always pointing away from the rotation axis, so as long as the plumb bob is not on the equator the centrifugal force and gravitational force are not along each other, and add to a different direction than towards the Earth CM.

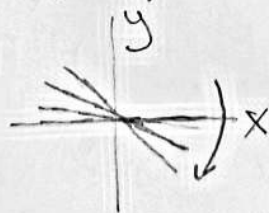
I think it would be perpendicular to the surface of a lake though, since the lake experiences the centrifugal force as well, causing its effective gravity to be in the same direction as the bob's.

②

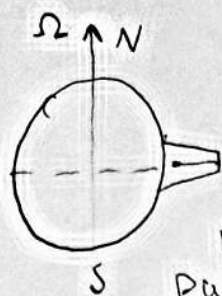


The object would feel a coriolis force pushing it to its right.

A Foucault Pendulum will have this force slowly rotate the axis which it swings along clockwise, since the bob itself has a coriolis force pushing it to the right (compared to the direction of its current motion).



③



When the bob is moving North-South, there is no precession (as long as the oscillations are small) since the motion of the bob is directly parallel with the Earth's angular velocity  $\Omega$ .   
 $\uparrow \quad \downarrow \leftarrow$  Pendulum motion back and forth

Therefore, by the right hand rule and cross product, there is no Coriolis force and thus no deflection in the plane of oscillation.

When the bob is moving East-West, there is still no precession. The pendulum has motion which does cause it to have a Coriolis force on it (in my diagram above the pendulum is moving in and out of the page). Thus, the motion of the pendulum is perpendicular to the Earth's angular velocity.

If we do the right hand rule on the two vectors, we find that the Coriolis force is either pushing the bob upwards (away from Earth's surface) when the bob is moving East, or pushing the bob downwards when it is moving West. Since neither of these forces have a component in the plane of oscillation, there is no rotation of this oscillation.

So, with small oscillations, the pendulum will have no precession while on the Equator, no matter its orientation. (this includes directions between N-S and E-W)