

# Potential energy of a planet

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How do you work out the gravitational potential of planets in the solar system? Do orbiting planets have gpe? And what would it be relative to?

The equation I know for it is  $mgh$ . But what would the acceleration ( $g$ ) be relative to? Should  $g$  take account of the accelerations due to all the planets? Do you just choose a random point? And what about  $h$ , which is some sort of distance - but which distance? I have read loads on google about gravitational potential, haven't found anything to answer this particular question though.

The formula  $U=mgh$  is simplified and assumes that you are near a planet's surface ( $g$  itself is only valid near the Earth's surface). This sounds kind of like a homework problem, so I'll give you some hints. First, you need to pick an origin (usually the star at the center of the system is a good place). Now you need to figure out the forces acting on the planets. Since the problem is asking for gravitational potential energy, you know that you only need to consider gravitational forces. Identify the gravitational forces and then integrate the force along the paths in question to calculate the potential energy. Be sure to maintain the same coordinate system throughout!

Making an assumption about your situation: you might be able to neglect the planet to planet gravitational force if the central force is much larger (which it should be, but I don't know what your problem statement was) and just calculate the potential energy due to the interaction between the planet and the star.

Thanks for contributing an answer to Physics Stack Exchange!

Use MathJax to format equations. [MathJax reference](#).

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