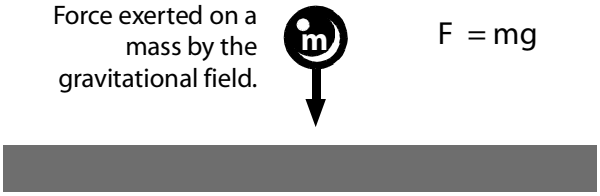
PhyzGuide: POTENTIAL ENERGY

side-by-side comparison of gravitational and electrical potential energy

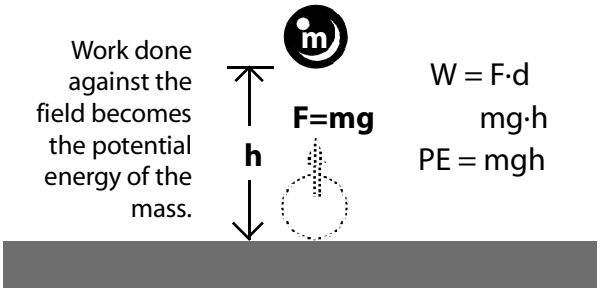
When a force is exerted on an object over a certain distance, we say that **work** has been done. When an object is immersed in a force field, we can do work on that object by moving it against the force exerted through the field. The work we do in such a case becomes the **potential energy** of the object. If the object is released, the *field* will do work on *it*—exerting a force on the object in accordance with the strength of the field and the susceptibility of the object to that field. For instance, a hammer dropped from a height of one meter is acted on by gravity. The force acting on the hammer would be stronger on the earth than on the moon because the earth's gravitational field is stronger than the moon's. If a penny were also dropped from one meter, it would not experience as much force because it has less mass. Mass is what makes an object susceptible to a gravitational field.

GRAVITY

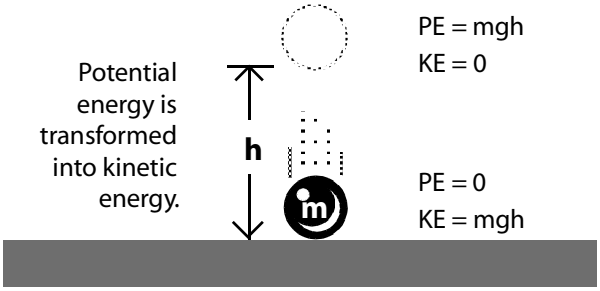
When lifting, work must be done to overcome the gravitational force. When dropped, the earth does work on the mass through that same force.



To lift the mass to a height *h*, a force equal to the gravitational force must be exerted. The force *mg* is exerted through the distance *h*.

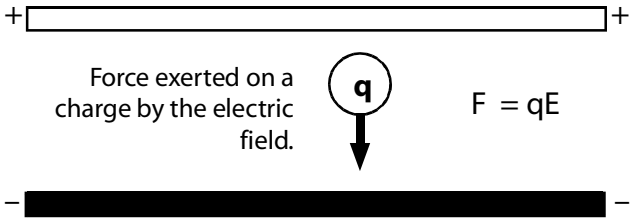


When the mass is released, the gravitational field does work on it, accelerating it toward the ground.

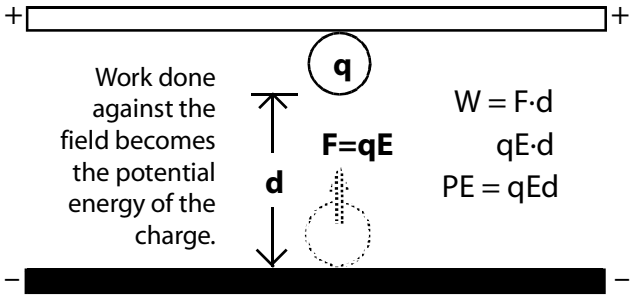


ELECTRICITY

When lifting, work must be done to overcome the electric force. When dropped, the plates do work on the charge through that same force.



To lift the charge by a distance *d*, a force equal to the electric force must be exerted. The force *qE* is exerted through the distance *d*.



When the charge is released, the electric field does work on it, accelerating it toward the negative plate.