The Law of Conservation of Energy (expanded)

Initial Energy = Final Energy

work done by engine +

initial EPE + initial GPE + initial KE **= final EPE** + final GPE + final KE + w.d. against friction

Potential energy released/energy going in	=	Potential energy stored/energy going out

Consider the energy it has at the beginning - I tend to think of this as the energy it has in the bank (a bit like money).

Some of this energy is 'spent' in various ways - it is either spent and converted into another type of energy - or it is spent on having to overcome friction/resistance. Some energy is not spent, but is instead increased (e.g. the KE may increase if it gets faster because GPE is converted to KE)

If there is a force/engine doing work, then there is more energy 'in the bank' to be converted. This is why it is on the LHS of the equation.

> A light elastic string, of natural length 1.6m and modulus of elasticity 10N, has one end fixed at a point A on a smooth horizontal table. A particle of mass 2kg is attached to the other end of the string. The particle is held at the point A and projected horizontally along the table with speed $2ms^{-1}$. Find how far it travels before first coming to instantaneous rest.

A particle of mass 0.5kg is attached to one end of an elastic string, of natural length 2m and modulus of elasticity 19.6N. The other end of the elastic string is attached to a point O. The particle is released from the point O. Find the greatest distance it will reach below O.

A light elastic spring, of natural length 1m and modulus of elasticity 10N, has one end attached to a fixed point *A*. A particle of mass 2kg is attached to the other end of the spring and is held at a point *B* which is 0.8m vertically below *A*. The particle is projected vertically downwards from *B* with speed $2ms^{-1}$. Find the distance it travels before first coming to rest.

A light elastic spring, of natural length 0.5m and modulus of elasticity 10N, has one end attached to a point *A* on a rough horizontal plane. The other end is attached to a particle *P* of mass 0.8kg. The coefficient of friction between the particle and the plane is 0.4. The particle initially lies on the plane with *AP* = 0.5m and is then projected with speed $2ms^{-1}$ away from *A* along the plane. Find the distance moved by P before it first comes to rest.

Edexcel M3 June 2014(R) Qu3

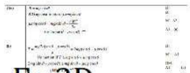
One end A of a light elastic string AB, of modulus of elasticity mg and natural length a, is fixed to a point on a rough plane inclined at an angle θ to the horizontal. The other end B of the string is attached to a particle of mass m which is held at rest on the plane. The string AB lies along a line of greatest slope of the plane, with B lower than A and $AB = a$. The coefficient of friction between the particle and the plane is μ, where $\mu < \tan\theta$. The particle is released from rest.

(*a*) Show that when the particle comes to rest it has moved a distance $2a(\sin\theta - \mu\cos\theta)$ down the plane.

(6)

(*b*) Given that there is no further motion, show that $\mu \geq \frac{1}{3}\tan\theta$.

(5)



Ex 3D

9 Two points A and B are on the same horizontal level with $AB = 3a$. A particle P of mass m is joined to A by a light inextensible string of length $4a$ and is joined to B by a light elastic string, of natural length a and modulus of elasticity $\frac{mg}{4}$. The particle P is held at a point C, such that $BC = a$ and both strings are taut. The particle P is released from rest.

a Show that when AP is vertical the speed of P is $2\sqrt{ga}$. **(6 marks)**

b Find the tension in the elastic string in this position. **(4 marks)**