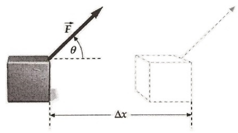
CHAPTER 5 SUMMARY. **Energy**

Justin Yang

NOVEMBER 22, 2012

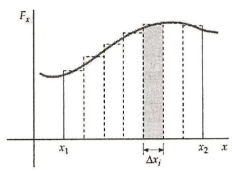
(1)____________



The (2)______________ done by a constant force $\vec{F}$ that moves an object a displacement Δx is defined as

(3) ________________________.

So $W = \vec{F} \cdot \Delta\vec{x}$.
Work is a (4)__________. The SI unit of work is the (5)__________ (J), $1\ \text{J} = 1\ \text{N} \cdot \text{m} = 1\ \text{kg} \cdot \text{m}^2/\text{s}^2$.
A (6)__________ is any object where all of its parts undergo equal Δx over any Δt. The total work done on a particle is the same as the work done by the net force on the particle, so the work done is the area under the F_x-versus-x curve:



(7) ________________________.

(8)________________

Under a constant *net* force F_{net} acting along a straight line on a particle of mass m, which is displaced by Δx along the straight line, the work done on the particle is

(9) ________________________.

Applying Netwon's second law (10)__________ and the kinematic relation (11)__________, we have

(12) ________________________.

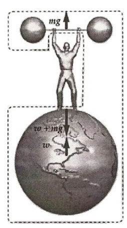
The quantity $\frac{1}{2}mv^2$ is defined as the (13)______________ of the particle

(14) ________________________.

Kinetic energy is a (15)__________. The SI unit of kinetic energy is the same as work: $\text{kg} \cdot \text{m}^2/\text{s}^2$ or J.
Kinetic energy depends on the mass and speed of the particle but not the direction of motion.
$W = \Delta K$. This is true even when the force is varying. This is known as the (16)______________.

(17)________________

The (18)______________ of a system is the energy associated with the configuration of the system. Often the work done by external forces on a system may result in an increase in the potential energy of the system.
(19)________________________ The gravitational force between an object of mass m and the Earth is $\vec{F} = -mg\,\hat{j}$, where h, $h_0 \ll r_E$, so the work done by gravity is



(20) ____________________________________.

When the object is near the surface of the Earth, the gravitational potential energy

(21) ______________.

Thus, the work done by gravity is at the expense of the gravitational potential energy:

(22) ______________.

(23)____________________ The work done by the spring force, $F = -kx$, is given as

(24) ____________________.

When the spring potential energy is zero at $x = 0$, the spring potential energy can be defined as

(25) ____________.

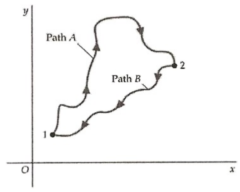
The work done by the spring force is then at the expense of the spring potential energy

(26) ____________.

(27)____________________________________

A force is conservative if on a particle $W_{\text{net}} = 0$ around *any* closed path.
We can use this property to define a (28)______________ U such that the force is the negative of the slope of the potential-energy U-versus-x curve:

(29) ____________________.



(30)________________ are forces that are not conservative.

(31)____________________________

A (32)____________ is a collection of particles. All forces are either (33)____________ or (34)____________. The change in E_{net} of a system is done through work and heat. Since $K = \sum K_i$, we obtain by the work-energy theorem

(34) ____________________.

The work done by all internal conservative forces can be recast as the change in the total potential energy of the system:

(35) ____________.

The sum $E_{\text{mech}} = K + U$ is known as the total mechanical energy of the system,

(36) ____________________________.

When $W_{\text{ext}} = 0$ and $W_{\text{nc}} = 0$, we get the (37)____________________:

(38) ____________________.

(39)____________________________

For an isolated system, we have $W_{\text{ext}} = 0$ and we may account of W_{nc} by changes in forms of energy other than mechanical energy. (40)____________________:

(41) ____________________________.

Work and heat are the ways to transfer energy in or out of a system. When $\Delta Q = 0$, we have:

(42) ____________________________________.

(43)____________________

Power is the rate at which energy is transferred. The average (44)____________ supplied by a force $\vec{F}$ is the rate at which the force does work:

(45) ____________________,

(46) ____________________.

The SI unit of power is J/s, also called the (47)____________. 1 W = 1 J/s = 1 kg $\cdot$ m^2/s^3.