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Kinetic Energy and Work

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Worksheets

Worksheet 1

Work, Energy and Power

There is another difference between static and sliding friction: sliding friction wastes energy. It can't make the energy disappear altogether because energy, as we've seen, is a conserved quantity: it can't be created or destroyed. But energy can be transferred between objects or converted from one form to another. What sliding friction does is convert useful, ordered energy – energy that can easily be used to do work – into relatively useless, disordered energy. This disordered energy is called thermal energy and is the energy we associate with temperature. It's sometimes called internal energy or heat. Sliding friction makes things hotter by turning work into thermal energy.

Energy is the capacity to do work and is transferred between objects by doing that work. Energy can also change forms, appearing as either kinetic energy in the motions of objects or as potential energy in the forces between or within those objects. With practice you can "watch" energy flow through a system just as an accountant watches money flow through an economy.

The most obvious form of energy is kinetic energy, the energy of motion. It's easy to see when kinetic energy is transferred into or out of an object. As kinetic energy leaves an object, the object slows down; thus moving water slows down as it turns a gristmill, and a bowling ball slows down as it knocks over bowling pins. Conversely, as kinetic energy enters an object, the object speeds up. A baseball moves faster as you do work on it during a pitch; you're transferring energy from your body into the baseball, where the energy becomes kinetic energy in the baseball's motion.

Potential energy usually isn't visible as kinetic energy. It can take many different forms, some of which appear in the Table. In each case nothing is moving; but because the objects still have a great potential to do work, they contain potential energy.

We measure energy in many common units: joules (J), calories, food Calories (also called kilocalories) and kilowatt-hours, to name only a few. All of these units measure the same thing and they differ from one another only by numerical conversion factors, some of which can be found in Appendix B. For example 1 food Calorie is equal to 1000 calories of 4184 J. Thus a jelly donut with about 250 food Calories contains about 1.000.000 J of energy. Since the joule is the same as a Newton-meter, 1.000.000 J is the energy you would use to lift your friend's file cabinet into the second floor apartment 200 times (1000 N times 5 m upward is 5000 J of work per trip). No wonder eating donuts is hard on your physique!

Several Forms and Examples of Potential Energy	
Form of Potential Energy	**Example**
Gravitational Potential Energy	A bowling ball at the top of a hill
Elastic Potential Energy	A wound clock spring
Electrostatic Potential Energy	A cloud in a thunderstorm
Chemical Potential Energy	A firecracker
Nuclear Potential Energy	Uranium

Of course you can eventually use up the energy in a jelly donut: it just takes time. You can only do such work each second. The measure of how quickly you do work is power – the amount of work you do in a certain amount of time, or

power = work / time

The SI unit of power is the joule-per-second, also called the watt (abbreviated W). Other units of power include Calories-per-hour and horsepower; like the units for energy, these units differ only by numerical factors, which are again listed in Appendix B. For example 1 hoursepower is equal to 745.7 W. Since 1 hoursepower motor does 745.7 J of work each second, and since it takes 5000 J of work to move the file cabinet to the second floor, that motor has enough power to do the job in about 6.7 s.

(taken from Louis A. Bloomfield, *How Things Work, The Physics of Everyday Life*, 2nd edition, The University of Virginia)

Language Strategies

Some common expressions for guessing the meaning of words in the context

definition:	is called also called
examples:	for example for instance such as like as an example to exemplify
similarity:	just as too similarly like/just like as also related resembling similar to alike
difference:	different from differ unlike
contrast:	but however in contrast instead even though although though nevertheless
punctuation marks:	commas dashes parenthesis columns

Worksheet 2(b)

Exercise 1

In how many ways can you guess the meaning of the words? Go through the reading passage and find out.

These are the answers:

1. ..., ,...
2. ...- -...
3. ...is called...
4. ...is...
5. ...(also called...)
6. ...for example,...
7. ...or...
8. ...like...

Exercise2

How many names can you list for 'disordered energy'?

These are the answers:

1. thermal energy
2. internal energy
3. heat
4. useless energy

Keywords and their Turkish equivalents

English	**Turkish**
Work	İş
Kinetic energy	Kinetik enerji
Work and kinetic energy theorem	İş-kinetik enerji teoremi
Work done by the gravitational force	Çekim kuvveti tarafınd an yapılan iş
Work done in lifting or lowering an object	Bir cismi kaldırır veya indirirken yapılan iş
Spring constant	Yay sabiti
Stiffness	sertlik
Relaxed state	Yayın denge konumu
Extention-compression	Uzatma-sıkıştırma
Work done by a spring force	Yay kuvveti tarafından yapılan iş
Work done by a variable force	Değişken bir kuvvet tarafından yapılan iş
Power	Güç
Steam engine	Buhar makinası

Listening and note-taking

Choose the right word for each definition and put it in the place provided.

Energy − work − joule – mechanical energy − kinetic energy − power − conservative force − potential energy – force − gravitational potential energy

1. ..... is done on an object when ..... acts on it in the direction of motion (work – force).
2. ..... is the capacity for doing work (energy).
3. ..... is the energy an object possesses because of its position in a gravitational field (gravitational potential energy).
4. ..... is the energy of motion (kinetic energy).
5. ..... is a derived unit of energy or work in the International System of Units. It is equal to the energy expended (or work done) in applying a force of one Newton through a distance of one meter (Joule).
6. ..... is a force with the property that the work done in moving a particle between two points is independent of the path taken (conservative force).
7. ..... is the sum of kinetic energy and the potential energy presenting the components of a mechanical system (mechanical energy).

Assessment grids

Assessment grid for content

Scores	Descriptors
1 *Unsatisfactory*	Student shows no knowledge of the subject.
2 *Almost satisfactory*	Student is lacking necessary background knowledge. S/he isn't able to solve simple exercises.
3 *Satisfactory*	Student has essential knowledge of the subject. S/he solves simple exercises similar to the ones done during lessons.
4 *Good*	Student shows a complete knowledge of the subject. S/he solves new exercises correctly.
5 *Excellent*	Student shows a complete and thorough knowledge of the subject. S/he solves most difficult exercises easily.

Assessment grid for language

Scores	Descriptors
1 *Unsatisfactory*	Student doesn't use the everyday English and the specific vocabulary on the subject matter at all.
2 *Almost satisfactory*	Student is able to use the everyday English and the specific vocabulary on the subject matter improperly.
3 *Satisfactory*	Student is almost able to use the everyday English and the specific vocabulary on the subject matter.
4 *Good*	Student is able to use the everyday English and the specific vocabulary on the subject matter properly.
5 *Excellent*	Student is able to use the everyday English and the specific vocabulary on the subject matter perfectly.

Assessment grid for co-operative work

Scores	Descriptors
1 *Unsatisfactory*	Student is unwilling to participate in the activities either feeling shy or uncomfortable about using the language.
2 *Almost satisfactory*	Student is willing to participate in some of the activities which require simple structures and vocabulary in English.
3 *Satisfactory*	Student is almost able to participate in many of the activities which require some complex structures and specific vocabulary in English.
4 *Good*	Student is able to participate in the activities which require good level of English.
5 *Excellent*	Student is able to participate in the activities which require perfect level of English.