Name:	
Science Class:	
Teacher:	
Hand in day:	

Y7 Science

Term 1 Homework Booklet

Physics

	Hand in Date	Parents Signature
Energy		
Homework 1		
Homework 2		
Homework 3		
Homework 4		

Y7 Energy Homework 1

Learn the units for energy and how to convert from kilojoules to joules

Learn how the equipment is set up, how to calculate temperature change and what conclusions can be made from the Energy in food experiment.

Energy Units

Energy changes are measured in joules (J) or kilojoules (kJ).

1000 J = 1kJ

To convert from J to kJ, divide by 1000.

Example: Convert 3000J into kilojoules.

3000J ÷ 1000 = 3kJ

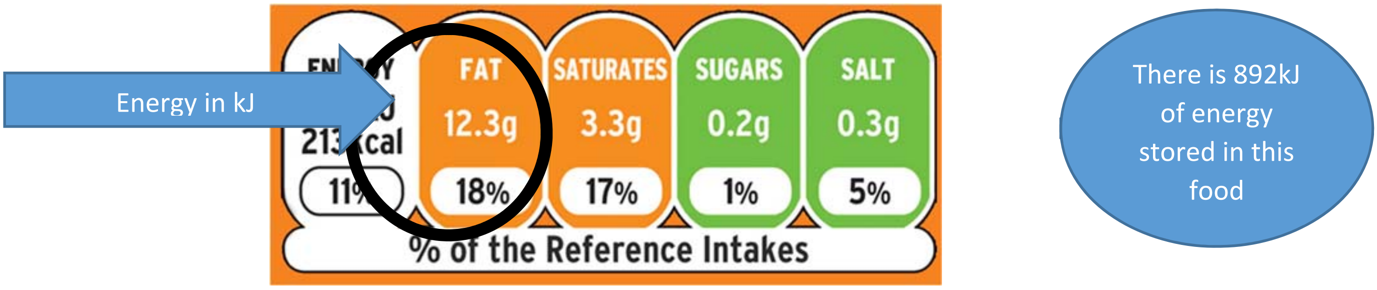
To convert from kJ to J, times by 1000.

Example: Convert 2kJ into joules.

2kJ x 1000 = 2000J

Energy in food – Food Labels

Energy stored in food can be released by combustion (burning) or by respiration in our cells. The labels on packets of food show how much energy is available from the food.



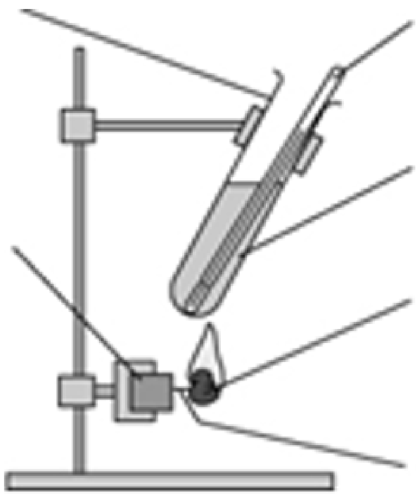
The amount of energy stored in food may be shown in a unit called the calorie (kcal), as in the photograph.

However, the scientific unit for energy is the joule, which has the symbol J.

A lot of energy is stored in most foods, so food labels usually show kJ (kilojoules) instead
of J.

Energy in food experiment

Equipment : Label the equipment



Example Results

Food	**Temperature at the beginning (°C)**	**Temperature at the end (°C)**	**Temperature difference (°C)**
salted peanuts	19	31	
cashew nuts	20	33	
raisins	21	27	

Calculate the temperature change

Temperature change = temperature at the end – temperature at the beginning

Conclusion

When the food is burned, the energy _______________in it is transferred to the ______________and made it hotter.

The food that gave the highest temperature change was __________________________, this means it stored the most ____________________ energy.

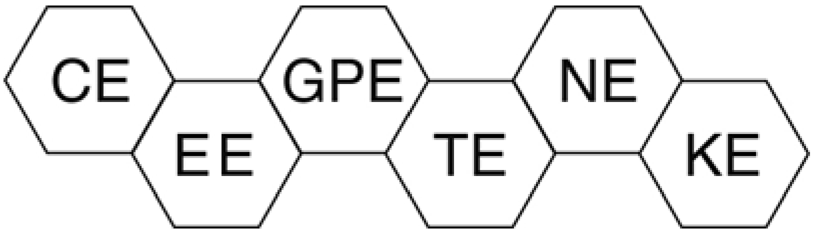
Y7 Energy Homework 2

Task 2 : Complete the table on energy stores and learn the definitions for next lesson

Energy Stores	**Definition**	**example**
Magnetic		
Thermal		
Chemical		
Kinetic		
Electrostatic		
Elastic		
Gravitational		
Nuclear		

Answer the questions below about each type of energy store.

Energy can be stored in different ways. All the energy is the same, but we sometimes give it names to help us to remember the way in which it is stored.



a What CE describes the way energy is stored in a sandwich?

____

b What EE describes the way energy is stored in a stretched spring?

____

c What GPE describes the way energy is stored in a person on a diving board?

____

d What TE describes the way energy is stored in a pan of boiling water?

____

e What NE describes the way energy is stored inside atoms?

____

f What KE describes the way energy is stored in a moving cricket ball?

____

Y7 Energy Homework 3

electricity	force	heating
light	sound	

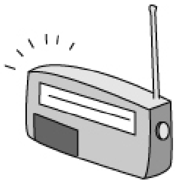
Fill in the gaps in the flow charts using words from the box. You can use some words once, more than once or not at all.

a You fire a stone from a catapult.

strain energy in the stretched elastic → energy transferred by a ____________ from the catapult → kinetic energy in the moving stone

b You switch on the radio.

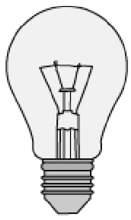
energy transferred to radio by ________________ →



→ energy transferred away from radio by ________________

c You switch on a light.

energy transferred to the light by ________________ →



→ energy transferred from the light by ________________

→ energy transferred from the light by ________________

Y7 Energy Homework 4

Learn the definition for energy dissipation, the equations for efficiency and percentage efficiency, and make sure you can perform calculations, including correct units with your answer.

Energy Conservation

Energy cannot be created or destroyed, just transferred from one store to another.

Energy Dissipation

Any energy that is not transferred to useful energy stores is said to be dissipated (or wasted) because it is lost to the surroundings.

Once dissipated, energy can no longer be stored usefully as the energy has spread out.

Energy is usually lost by heating up the surroundings.

Energy Efficiency

Devices are designed to waste as little energy as possible. This means that as much of the input energy as possible should be transferred into useful energy stores.

How good a device is at transferring energy input to useful energy output is called efficiency.

A very efficient device will waste very little of its input energy.

A very inefficient device will waste most of its input energy.

$$\textit{Efficiency} = \frac{useful\ output\ energy}{total\ input\ energy}$$

$$\textbf{\textit{Percentage Efficiency}} = \frac{\boldsymbol{useful\ output\ energy}}{\boldsymbol{total\ input\ energy}}\ \boldsymbol{x100\%}$$

Energy changes are measured in joules (J) or kilojoules (kJ).

There are no units for efficiency.

Example: The energy supplied to a light bulb is 200J. A total of 40J of this is usefully transferred as light. How efficient is the light bulb?

$$\textit{Efficiency} = \frac{useful\ output\ energy}{total\ input\ energy} = \frac{40J}{200J} = 0.2$$

$$\textit{Percentage Efficiency} = \frac{useful\ output\ energy}{total\ input\ energy}\ x100 = \frac{40J}{200J}\ x100 = 0.2\ x\ 100 = 20\%$$

Complete the questions on efficiency

Q1.

The drawings below show what happens to the energy supplied to four appliances.

kettle

98% of the energy is used to heat the water

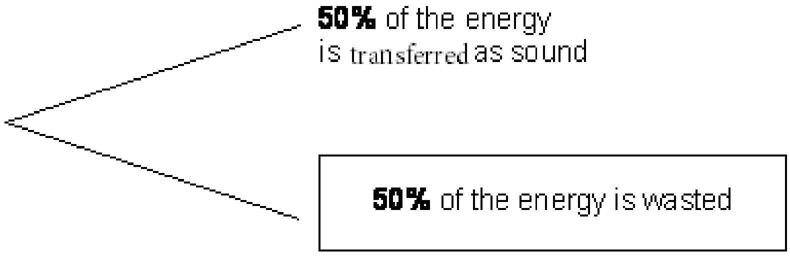
2% of the energy is wasted

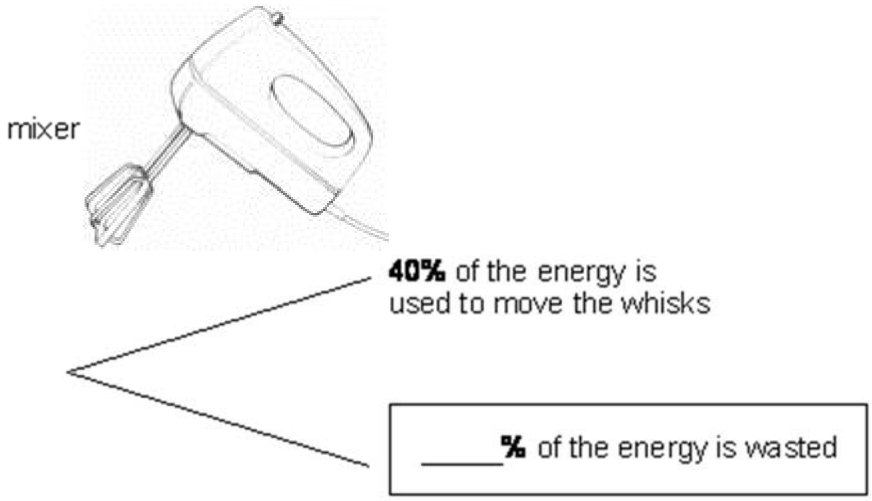
light bulb

______**%** of the energy is transferred as light

95% of the energy is wasted

radio





(a) (i) What percentage of energy of the light bulb is given out as light?
Write your answer on the line by the light bulb.

1 mark

(ii) What percentage of energy is wasted by the mixer?
Write your answer in the box by the mixer.

1 mark

(iii) Complete the sentence below.

Parts of the mixer become hot because some of the electrical energy is changed into .... energy which is wasted.

1 mark

(b) Energy is wasted as sound in many appliances.
Which appliance in the drawings produces sound which is **not** wasted?

....

1 mark

(c) In which of the appliances is the highest percentage of energy wasted?

....

1 mark

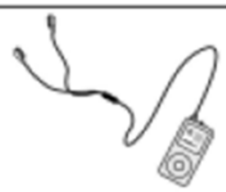
Maximum 5 marks

Q2.

(a) The diagrams in **List A** show three electrical appliances. Each appliance is designed to transfer electrical energy.

Draw **one** straight line from each appliance in **List A** to the useful output energy produced by that appliance in **List B**.

Draw only **three** lines.

List A **Appliance**	**List B** **Useful energy output**
 MP3 player	Light
 Food processor	Sound
 Desk lamp	Electrical
	Kinetic

(3)

(b) The diagram shows the energy transfers produced by a TV.

(i) Which are the useful energy outputs?

....

....

(1)

(ii) Use the information in the diagram to calculate the efficiency of the TV.

Write down the equation you use, and then show clearly how you work out your answer.

....
.

....
.

Efficiency = ...

(2)

(iii) What eventually happens to the useful energy transferred by the TV?

....

....

(1)

(Total 7 marks)

Year 7 Energy in Foods

Energy Units

Energy changes are measured in joules (J) or kilojoules (kJ).

1000 J = 1kJ

To convert from J to kJ, divide by 1000.

Example: Convert 3000J into kilojoules.

3000J ÷ 1000 = 3kJ

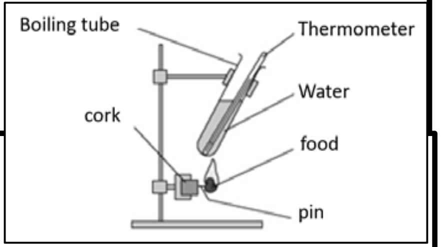
To convert from kJ to J, times by 1000.

Example: Convert 2kJ into joules.

2kJ x 1000 = 2000 J

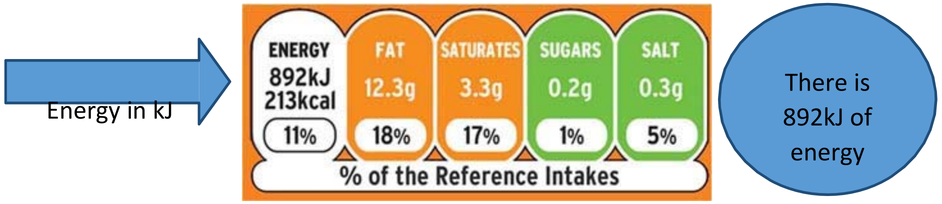
Method

1. Choose three different types of food and draw a results table
2. Put one piece of food on the pin and find the mass of the cork, pin and food together. Write the name of your food in your table.
3. Use the measuring cylinder to measure 10cm^3 of water, and put it into the boiling tube. Record the temperature of the water.
4. Light the food using the Bunsen burner, and hold the burning food under the boiling tube. Make sure the flame is touching the boiling tube.
5. When the food has finished burning record the temperature of the water again. Let the food cool down and find the total mass of the cork, pin and food remaining on it.
6. Repeat for the other foods.



Energy in food – Food Labels

Energy stored in food can be released by combustion (burning) or by respiration in our cells. The labels on packets of food show how much energy is available from the food.



The amount of energy stored in food may be shown in a unit called the calorie (kcal), as in the photograph. However, the scientific unit for energy is the joule, which has the symbol J.

A lot of energy is stored in most foods, so food labels usually show kJ (kilojoules) instead of J.

Example Results

Food	Temperature at the beginning (°C)	Temperature at the end (°C)	Temperature difference (°C)
salted peanuts	19	31	12
cashew nuts	20	33	13
raisins	21	27	6

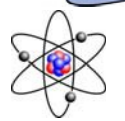
Temperature change = temperature at the end – temperature at the beginning

Conclusion

When the food is burned, the energy stored in it is transferred to the water and made it hotter.

The food that gave the highest temperature change was cashew nuts, this means it stored the most chemical energy.

Energy Stores

Energy Stores	Description	Examples	Picture
Magnetic	The energy stored in two separated magnets that are attracting, or repelling	Fridge magnets, compasses.	
Thermal	The energy stored in a warm object.	Human bodies, hot coffees, stoves or hobs.	
Chemical	The energy stored in chemical bonds, such as those between molecules.	Food, muscles, electrical cells.	
Kinetic	The energy stored in a moving object	Runners, moving buses, moving cars.	
Electrostatic	The energy stored in two separated electric charges that are attracting, or repelling.	Thunderclouds, Van De Graaff generators.	
Elastic	The energy stored when an object is stretched or compressed.	Stretched elastic, compressed springs, inflated balloons.	
Gravitational	The energy stored when an object is moved higher.	Aeroplanes, kites, mugs on a table.	
Nuclear	The energy stored in atoms.	Nuclear fuel, radioactive material	

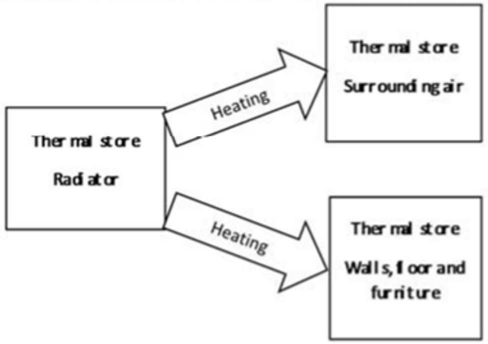
Energy Transfers

Energy transfer diagrams

Energy transfer diagrams may be used to show the locations of energy stores and energy transfers.

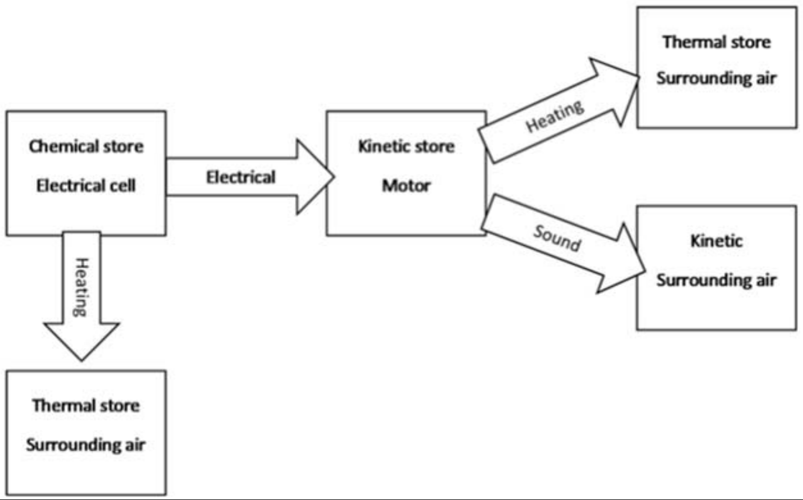
<u>**Example 1**</u>

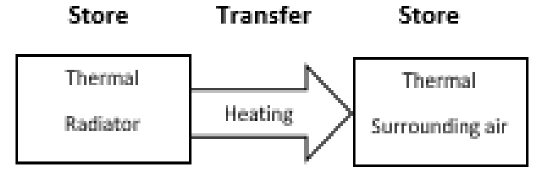
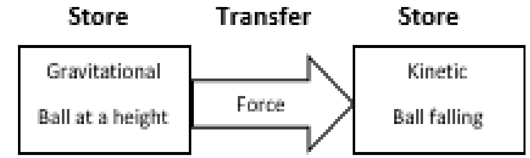
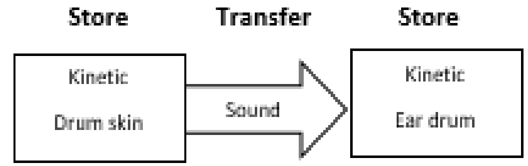
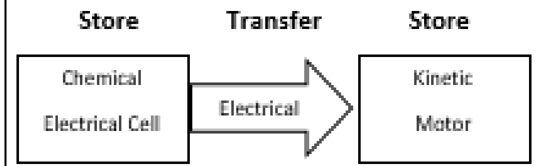
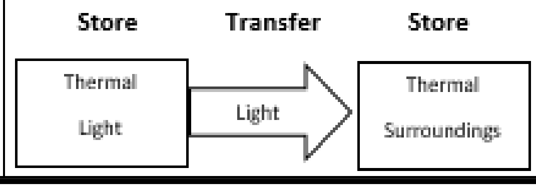
When a radiator heats up the air in a room, some energy is used to heat the air in the room. However, some of the energy is also transferred to the walls, floor and furniture. This can be shown by adding more transfers to our earlier example.



<u>**Example 2**</u>

When an electrical cell turns a motor, some energy is used to turn the motor, but some energy is transferred by heating to the surroundings. As the motor turns some energy is transferred to the surroundings by heating and sound.



<table>
<tr><th></th><th>Definition</th><th>Examples</th></tr>
<tr><td>Heating</td><td>Energy is transferred from a hotter object to a cooler one.</td><td>A radiator heating the air in a room.

</td></tr>
<tr><td>Force</td><td>Energy is transferred when a force moves through a distance.</td><td>A ball falling from a height.

</td></tr>
<tr><td>Sound</td><td>Energy transferred by the vibration of particles.</td><td>Hearing the sound of a drum being hit.

</td></tr>
<tr><td>Electrical</td><td>Energy is transferred when moving charges in a wire.</td><td>An electrical cell turning a motor.

</td></tr>
<tr><td>Light</td><td>Energy is transferred by light waves.</td><td>A bulb lighting up a room.

</td></tr>
</table>

Energy Efficiency and Sankey Diagrams

Energy Conservation

Energy cannot be created or destroyed, just transferred from one store to another.

The total energy of a system stays the same. The idea that the total energy has the same value before and after a change is called conservation of energy.

Energy Dissipation

Any energy that is not transferred to useful energy stores is said to be dissipated (or wasted) because it is lost to the surroundings.

Once dissipated, energy can no longer be stored usefully as the energy has spread out.

Energy is usually lost by heating up the surroundings.

Examples

Friction in mechanical systems, such as motors.

Tumble dryers heating the surrounding air.

Filament bulbs wasting energy as heat

Energy Efficiency

Devices are designed to waste as little energy as possible. This means that as much of the input energy as possible should be transferred into useful energy stores.

How good a device is at transferring energy input to useful energy output is called efficiency.

A very efficient device will waste very little of its input energy.

A very inefficient device will waste most of its input energy.

$$\textit{Efficiency} = \frac{\text{useful output energy}}{\text{total input energy}}$$

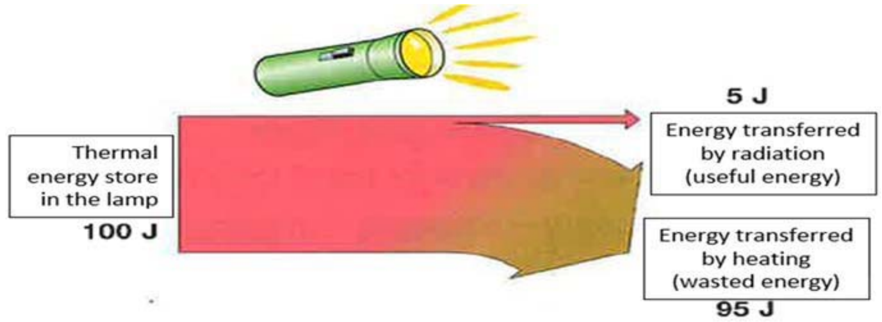
Energy changes are measured in joules (J) or kilojoules (kJ).

There are no units for efficiency.

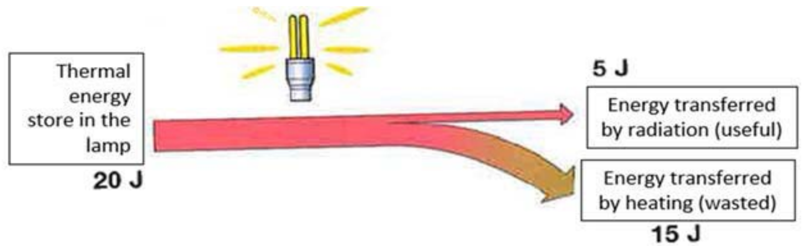
Sankey diagrams

You can show energy transfers in a Sankey diagram. Sankey diagrams start off as one arrow that splits into two or more points. This shows how all of the energy in a system is transferred into different stores.

Old filament bulbs transfer most of their energy by heating to the surroundings, but only a small amount is transferred as light.



New energy saving bulbs transfer most of their energy as light, and only a small amount is transferred by heaθng to the surroundings.



Example: The energy supplied to a light bulb is 200J. A total of 40J of this is usefully transferred as light. How efficient is the light bulb?

$$\textit{Efficiency} = \frac{\text{useful output energy}}{\text{total input energy}} = \frac{40J}{200J} = 0.2$$

$$\textit{Percentage Efficiency} = \frac{\text{useful output energy}}{\text{total input energy}} \times 100 = \frac{40J}{200J} \times 100 = 0.2 \times 100 = 20\%$$