



# Physics

## 1. Energy

## Revisiting Booklet

Name:

## Energy stores and systems

1) Name as many types of energy as possible. Underline those that are types that can be examples of stored energy

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- 
- 
- 

2) What are the energy changes in the following situations?

- a) A ball thrown upwards  
energy at start \_\_\_\_\_ energy at end \_\_\_\_\_
- b) An object hitting an obstacle  
energy at start \_\_\_\_\_ energy at end \_\_\_\_\_
- c) An object accelerated by a person pushing it  
energy at start \_\_\_\_\_ energy at end \_\_\_\_\_
- d) A moving bike putting on its brakes  
energy at start \_\_\_\_\_ energy at end \_\_\_\_\_
- e) A kettle boiling some water  
energy at start \_\_\_\_\_ energy at end \_\_\_\_\_

## Changes in energy

1) What are the formulas for the following:

The kinetic energy of an object can be calculated using the equation:

Word equation:

Symbol equation:

Units:

The gravitational potential energy of an object can be calculated using the equation:

Word equation:

Symbol equation:

Units:

The Energy stored in a spring of an object can be calculated using the equation:

Assuming \_\_\_\_\_ is not exceeded

Word equation:

Symbol equation:

Given to you

Units:

Kinetic energy

Calculate the kinetic energy for the following;

- a) The energy of a 1200kg car travelling at 20m/s

.....  
..... units .....

- b) The energy of a 1200000g car travelling at 40m/s

.....  
..... units .....

c) The energy of a person with a mass of 60kg running at 5 m/s

.....  
..... units .....

d) *Harder* The mass of a tennis ball which has a velocity of 36m/s and an energy of 64.8J

.....  
..... units .....

e) *Harder* The velocity of a bird with a mass of 0.5kg with an energy of 400J

.....  
..... units .....

Gravitational potential energy

Calculate the potential energy for the following. Assume gravitation field strength of 10N/kg

a) A person with a mass of 50kg who walks up stairs to a height of 5m high.

.....  
..... units .....

b) A plane which has a mass of 10,000kg which travels up to a height of 1000m

.....  
..... units .....

- c) A rollercoaster car of mass 400kg containing four people with a mass of 250kg which goes up to a height of 80m.

.....  
 ..... units .....

- d) A rocket of mass 5 tone travelling to a height of 1500m

.....  
 ..... units .....

- e) *Harder* what height does a paper plane of mass 20g have if it gains 1J of energy?

.....  
 ..... units .....

- f) *Harder* what mass does a Frisbee have if it is thrown up 20m and gains 4J of energy.

.....  
 ..... units .....

Elastic potential

Calculate the following:

- a) The elastic potential for a bow with a spring constant of 100 which is pulled back 65cm (think about the unit)

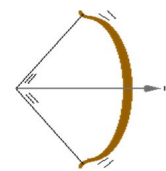
Elastic Potential Energy

- The energy from a spring being altered from its standard shape.

$$E_p = \frac{1}{2} kx^2$$

k: spring constant

x: distance spring is stretched or compressed.



.....  
 ..... units .....

b) The elastic potential in a bungee jumping cord with a spring constant  $k=2$  which extends 40m

.....  
..... units .....

c) *Harder* what is the extension of a slinky with a spring constant of 0.2 when it stores 3J of energy?

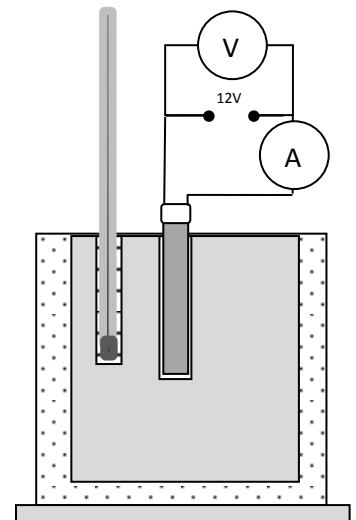
.....  
..... units .....

**Energy changes in systems**

Specific heat capacity is the \_\_\_\_\_  
\_\_\_\_\_

**Required practical activity 14:** determine the specific heat capacity of a material

Method:



The amount of energy stored in or releases from a system from its temperatures changes can be calculated using the equation:

Word equation:

Symbol equation:

Units:

Given to you  
T can be  
represented  
as  $\theta$

Calculate the energy needed to raise the temperature of a 0.2kg aluminium block from 15°C to 40°C. Aluminium specific heat capacity is 900 J/kg °C

.....  
..... units .....

Calculate the energy transferred when 100g of water is heated from 25°C to 50°C. The specific heat capacity of water is 4.2 J/kg/°C.

.....  
..... units .....

Calculate the specific heat capacity of copper. It took 10.78kJ to heat 1kg of copper from 22°C to 50°C.

.....  
..... units .....

**Power**

What is power?

.....

What are the two power equations?

Word equation:

Symbol equation:

Units:

Word equation:

Symbol equation:

Units:

A motor transfers 4.8kJ of energy in 2 minutes. Find its power.

.....

..... units .....

How long does it take for a 550W motor to do 110J of work?

.....

..... units .....



A powerful machine is one which can transfer a lot of energy in a shorter time (not necessarily one which exerts the most force).

It takes 8000J of work to lift a stunt performer to the top of a building. Motor A can lift the stunt performer to the correct height in 50s. Motor B would take 300s to lift the performer to the same height. Which motor is more powerful. Calculate the power.

.....  
.....  
..... units .....

**Energy transfers in a system**

Energy can be \_\_\_\_\_, \_\_\_\_\_ or \_\_\_\_\_ but cannot be \_\_\_\_\_ or \_\_\_\_\_. This means that in a closed system (where nothing can enter or exit) the net energy change would be \_\_\_\_\_.

Dissipated energy is energy that is often describes as \_\_\_\_\_.

Unwanted energy transfers can be reduced. For example to reduce heat loss from a kettle it is \_\_\_\_\_. The higher thermal conductivity of a material the higher the rate of \_\_\_\_\_. To reduce energy being used to overcome friction in a turbine \_\_\_\_\_ can be used.

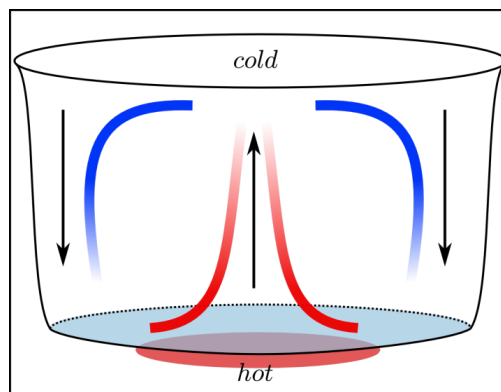
List 6 ways to insulate a home

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

What are the three methods of energy transfer by heating?

- .....
- .....
- .....

Use the diagram and describe the process of convection.



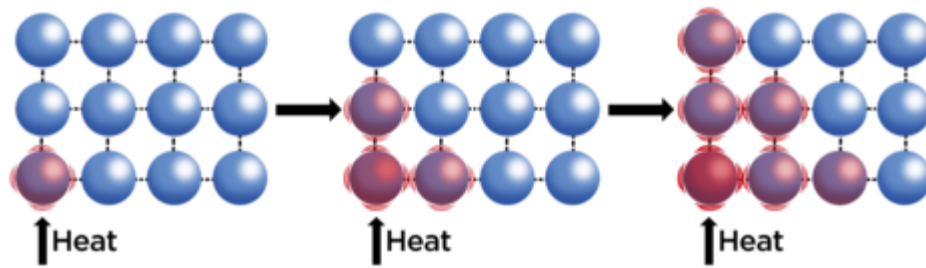
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Use the diagram and describe the process of conduction.



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**Efficiency**

Efficiency can be calculated by using 1 of two equations:

Equation 1:

Equation 2:

Efficiency can be left as a decimal or x100 to convert into a percentage.

An electric fan is supplied with 2000kJ of energy. 600kJ of that is transferred to useless thermal energy stores. What is the efficiency of the fan as a percentage?

.....

..... units .....

A lamp with an efficiency of 0.740 is supplied with 350J of energy. How much energy is usually transferred by the lamp?

.....  
..... units .....

A motor is supplied with 250W of power and outputs 120W of useful power. What is the efficiency of the motor? Give your answer as a decimal.

.....  
..... units .....

**National & global energy resources**

List the main energy resources used on Earth & underline the renewable ones

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.

A renewable energy resource is \_\_\_\_\_

What are the main uses of energy sources?

- 1.
- 2.
- 3.

Method of generating electricity	How does it work?	Advantages	Disadvantages
Solar			
Wind			
Geothermal			
Waves / Tidal			
Fossil fuels			
Nuclear			

