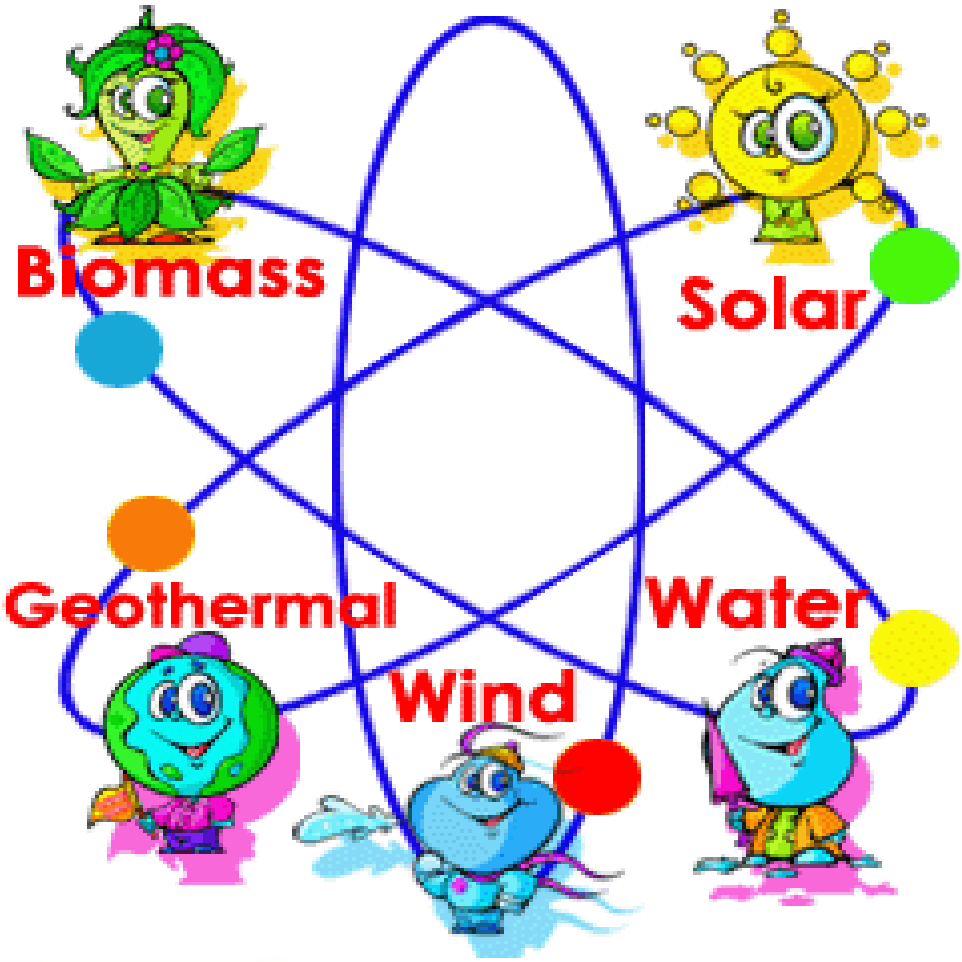
Physics and Chemistry 2nd Year

Name:

Group:



And you?

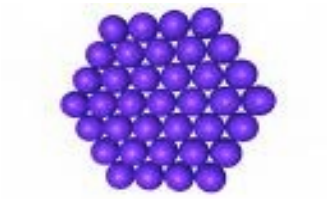
Unit 1. Matter.

1.Vocabulary:

Homogeneous, inhomogeneous, harmless, furthermore, poisonous, former, latter, heterogeneous.

2.States of the matter and changes of state.

States of the matter

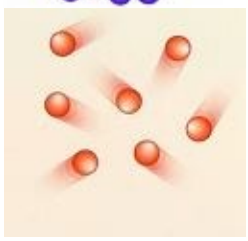


Solids.

-Particles are very close together.
-Particles are held together by strong forces.
-Particles vibrate but have fixed positions.
-Solids have a definite shape and volume and are hard to compress. They don't flow.

Liquids.

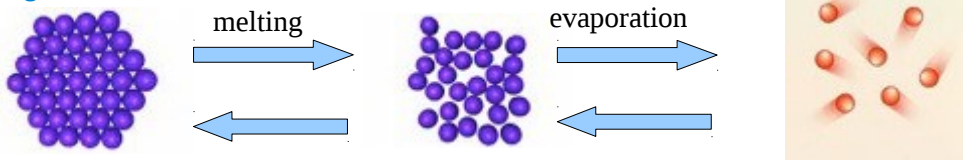
-Particles are close together.
-Particles are held together by forces of attraction.
-Particles may move relative to each other.
-Liquids have a definite volume, but not a definite shape. They take the shape of their containers, are hard to compress, and they flow easily.



Gases.

-Particles are far apart from each other.
-There are no forces of attraction between particles.
-Particles may move relative to each other.
-Particles do not have a definite volume or shape and are easy to compress. They flow easily.

Changes of state.



Melting and boiling.

What happens when a solid is heated until it turns into a gas?
-The particles of the solid are heated and vibrate more.
-The vibration of the particles overcomes the forces of attraction between the particles. As the solid melts the temperature remains constant.
-The particles of the liquid are heated and move more quickly.
-The movement of the liquid particles overcomes the forces of attraction between the particles. As the liquid boils the temperature remains constant. The particles in the gas move faster as it is heated further.

Activities.

1.Name the three states of the matter.
2.In which of the states are the particles closest together?
3.Do solids have a definite volume?
4.In which state are particles held together by forces of attraction, but the particle may move relative to each other?
5.Can liquids be compressed?
6.Are there any forces of attraction between gas particles?
7.Can gases be compressed easily?
8.In which process do gases turn into a liquids?
9. In which process do solids turn into a liquids?

3.Elements, compounds and mixtures:

All substances have mass and therefore must be composed of atoms. These atoms and how they assemble themselves in the substance determines their chemical and physical properties. All matter falls into one of three categories: elements, compounds or mixtures. Furthermore, mixtures can be classified as homogeneous or heterogeneous.

Elements

- Cannot be decomposed into simpler substances (by any chemical reaction).
- Are made up of only one kind of atom
- They have a symbol, example N (nitrogen), O (oxygen)

Compound

- Are made up of two or more elements
- Have a fixed composition, e.g., water (H_2O) has fixed proportions, by mass, of hydrogen (H) and oxygen (O). i.e. 2 H atoms for every one oxygen atom.
  The physical and chemical properties of compounds are different to those of the elements that make them, e.g. sodium chloride (NaCl) is common table salt and is relatively harmless and stable. The elements that combine to make NaCl are sodium (Na) and chlorine (Cl). The former is violently reactive, while the latter is a poisonous gas.

(Both are pure substances)

Activity:

1.Complete the table:

Pure substance	Element/Compound	Drawing
Iron		
Carbon dioxide		
Ammonia		
Hydrogen		

Mixtures

- Are combinations of two or more substances (elements or compounds).
- Mixtures can be homogeneous or heterogeneous .
- Mixtures have variable composition. i.e. they may be mixed in any proportion.
- Mixtures can be separated into substances by physical processes. e.g. filtration separates substances according to particle size.
- Substances in the mixture retain their individual chemical and physical properties.

There are two types of mixtures:

- **Homogeneous mixtures**
  - Are also known as solutions
  - Are uniform throughout. i.e. if you take a sub-sample, it is representative of the whole mixture.
  - Examples include: sodium chloride (table salt) dissolved in water.
- **Heterogeneous mixtures**
  - Are not uniform throughout. i.e. if you take a sub-sample, it is not representative of the whole mixture.
  - Examples include: beach sand, milk, granite.

Activity:

2.Classify the following substances (elements, compounds, mixtures, type of mixture) and explain your classification:

Sand, salty water, sulphur dioxide (SO_2) gold (Au) water with oil

carbon monoxide (CO) oxygen (O_2) Ozone (O_3).

Unit 2. Physical and Chemical Changes.

1.Vocabulary:

Link up, bubbles, precipitate, baking soda, waterfall.

2.Physical and Chemical Changes; how to tell the difference:

Physical Change

-Substance may seem different, but the way the atoms link up is the same.

-It's a physical change if:

It changes shape or size.

It dissolves.

It changes its state.

It changes its position.

Chemical Change

-Changes the way the molecules link up.

-Makes new substances.

-It's a chemical change if...

It bubbles (makes a gas).

It changes colour.

It forms a precipitate.

Activities.

3.What kind of change is it if someone...

-Tears up paper?

-Mixes salt and water?

-Burns paper?

-Evaporates salt water?

-Mixes vinegar and baking soda?

4.Classify the following changes as physical and chemical changes. Justify your answer.

-Water falling over a waterfall.

-Lava from a volcano solidifying.

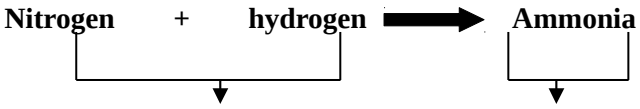
-A plane taking off.

-Iron nails moving due to presence of a magnet.

-Food going off after a few days.

3.Chemical transformations.

Chemical reactions are processes in which new substances appear and/or disappear. New substances (**products**) are formed from initial substances (**reactives**) with different properties.



Reactives Product

-Representation of chemical reactions: chemical equations.

This is known as a chemical equation.

Each substance is represented by a **chemical formula**. In the example, ammonia is represented by the formula NH_3.

Activities.

5.Make diagrams to illustrate the following chemical reactions.

-Two molecules of hydrogen (each one with two atoms) combine with one molecule of oxygen (with two atoms) to make two molecules of water (each one with two atoms of hydrogen and one atom of oxygen).

-Two molecules of nitrogen monoxide (each one with one atom of oxygen and one atom of nitrogen) combine with a molecule of oxygen (made up of two atoms of oxygen) to form two molecules of nitrogen dioxide (each one with two atoms of oxygen and one atom of nitrogen).

Complementary activities.

1A. Classify the processes according to their physical or chemical changes:

1. Water freezing in an ice tray in the freezer of the fridge.
2. Combustion of gas in the boiler.
3. Temperature increase inside the oven.
4. Boiling water.
5. Heating up the filaments of a toaster.
6. Extracting the juice from several orange.
7. Burning a piece of bread through leaving it too long in the toaster.

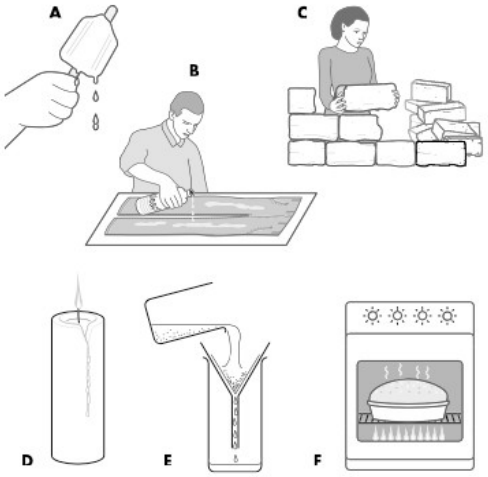
2A.http://www.chem4kids.com/activities.html (to do test about different topics)

1.R. Do the activity you have in the following page.

CHAPTER 6 WORKSHEET 1

F1 Chemical reactions or not?

Look at the drawings. Some show **chemical reactions** and some do not.



a Decide which are chemical reactions and which are not, then write down the letters.
Remember: In a **chemical reaction**, you end up with a **different** substance (or substances).

Chemical reactions: .....

Not chemical reactions: .....

b Which drawing shows a **change of state** happening?

.....

c Which shows the substances in a **mixture** being separated?

.....

Unit 3. Movement and force.

1.Vocabulary:

Drawn, arrival, path, speedometer, mean speed, race, runner, standstill, sprint, cover up, mnemonic, measurements, sloping upwards, push, pull, bend, stretch, squash, twist, turn, wind, flowing water, friction.

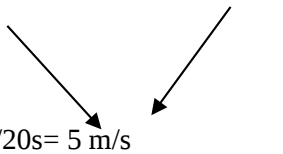
2.Basic concepts for studying movement.

In order to understand the movement of objects, to know the change of position, to calculate the speed at which they move, etc., we must know some basic concepts.

1. The **position** of moving object indicates where the object is, you need a point of origin as a reference.
2. The **trajectory** is the line 'drawn' by a moving object during its path.
3. The **displacement** is the distance between the starting point and the point of arrival of the moving object.
4. The **speed** is the distance travelled by something in a certain time. The units of speed depend on the units used to measure the time and distance, e.g. metres per second (m/s), miles per hour (mph) and kilometres per hour (km/h).

To work out a speed you divide the distance by the time taken. For example, in a100m running race:

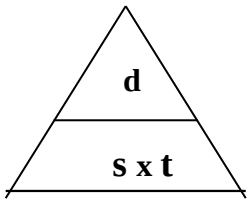
distance = 100metres ÷ time = 20seconds



speed =100m/20s= 5 m/s

A car has a speedometer that tells you the speed at a certain moment. However, usually we work out the average or **mean speed**. For instance, in a 100m running race, the runner does not sprint at the same speed over the whole 100m; he or she starts from a standstill and gets faster.

Remember how to calculate speed using this triangle: cover up the **s** and it shows that you need to divide distance by time. Think up a mnemonic to remember the order of letters (e.g. **d**on't **s**top **t**here!)



Activities.

1.What are the units of speed if these measurements are taken:

1. time in hours, distance in miles
2. time in years, distance in metres
3. distance in metres, time in seconds
4. distance in kilometres, time in hours?

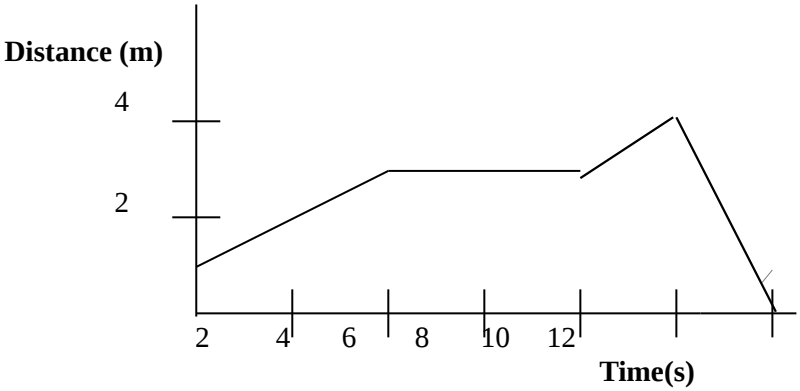
2.Work out these mean speeds:

1. an athlete runs 200 metres in 20 seconds
2. a car takes 3 hours to travel 60kilometres
3. a bus covers 10 miles in half an hour
4. Martin runs 3 kilometres in half an hour

3.Complete the following table:

DISTANCE	TIME	SPEED
50km		10km/h
2m		2cm per year
150,000,000 km	500s	
1km		3m/s
	1 year	300,000,000m/s
1km		50m/s
600m	1min	m/s
72km	2h	m/s
360km	minutes	100m/s

4.The movement of an object can be described using a distance/time graph. One such graph is shown below for the motion of a cat.



a)What does a <u>horizontal line</u> mean in a <u>distance-time</u> graph ?

b)What does a <u>line sloping upwards</u> mean in a <u>distance-time</u> graph?

c)What does the above <u>distance-time</u> graph tell you about the <u>motion</u> of the cat it describe? (HINT: do it in four separate parts: 0-4s, 4-8s, 8-10s and 10-12s)

0-4s: .....
4-8s: .....
8-10s:.....
10-12s:.....

5.Express the following speeds in km/h:

a) The speed of sound in the air: 340m/s.

b) The speed of light in the air: 300,000km/s.

c) The speed of the Earth around the Sun: 30,000m/s.

3.Forces.

-A force is any kind of push or pull. We cannot see a force, only what it does.

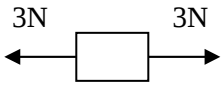
- A force can make a still thing move. It can make a moving thing travel faster, more slowly or in a different direction. A force may stop a moving object altogether.

-Together, two or more forces can make something bend, stretch, squash, twist or turn.

-Gravity, wind, flowing water, magnetism and friction are some common forces.

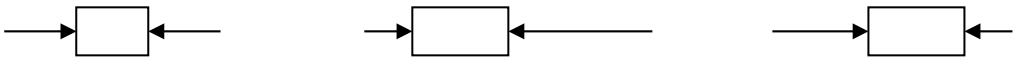
-Scientists measure forces in newtons (N).

-Something that has no forces acting on it or has **balanced forces** acting on it is either stationary or moving at a constant speed.



-If you have two forces acting in opposite directions but one force is bigger than the other, they are **unbalanced forces**. Unbalanced forces cause things to change speed. A change in speed is called an **acceleration.**

6.What will happen to the speeds of these objects? (at the beginning all are moving to the right)



Complementary activities.

R.1. Draw a line to link the correct word equations on the left with the correct symbol equations on the right.

SPEED = DISTANCE ÷ TIME t = d ÷ s

TIME = DISTANCE ÷ SPEED d = s x t

DISTANCE = SPEED X TIME s = d ÷ t

R.2. Use the equations from question R.1. to complete the following table.

Distance (m)	Time (s)	Speed (m/s)
10	5	
0.5	2	
1,000	10	
20	0.1	
500		10
	4	12
1		100
10		0.2
	15	15
200		0.02

A.1.

Do the test on the following site:

http://www.bbc.co.uk/bitesize/ks2/science/physical_processes/

1.R. Do the activity you have in the following page.

CHAPTER 7

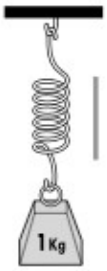
WORKSHEET 1

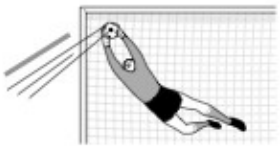
G1 Different types of forces

Study the diagrams. They show forces in action.

A This force changes the direction of the moving ball.

B The force stretching the spring is the force of gravity.





C This force makes the moving ball stop moving.

D This force keeps the trolley moving at the same speed.

E There are two forces on the cracker.

F The force is gravity.

a On each drawing, put an arrowhead on the thick grey line or lines to show the direction in which the force is acting.

b All forces are either **push** or **pull**. Decide which drawings show **push** forces and which show **pull** forces. Then fill in the table with the right letters.

Push forces	**Pull forces**

CHAPTER 7

WORKSHEET 1

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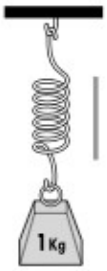

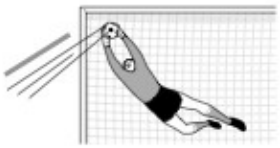

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Push forces	**Pull forces**

CHAPTER 7 WORKSHEET 6

G6 Speed (page 1)

1 **Speed** is the rate at which an object travels. When speed is measured in metres per second, 'metres' gives the distance and 'second' gives the time. We can measure speed in different **units** such as:

A metres per second

B kilometres per hour

Decide which units, **A** or **B**, you would use to describe the speed of the following. Then write in the correct units.

1 A cyclist. .....

2 A sprinter. .....

2 This is the correct way to work out speed.

$$\textbf{Speed} = \frac{\textbf{distance}}{\textbf{Time}}$$

a Work out the following speeds. You can use a calculator.

Speed = $\frac{90 \text{ metres}}{10 \text{ seconds}}$ Answer: ..... metres per second

Speed = $\frac{10 \text{ metres}}{2 \text{ seconds}}$ Answer: ..... metres per second

b Work out these speeds.

Speed = $\frac{3 \text{ kilometres}}{1 \text{ hour}}$ Answer: ..... kilometres per hour

Speed = $\frac{16 \text{ kilometres}}{2 \text{ hours}}$ Answer: ..... kilometres per hour

c In question **a** above, which speed was faster?

.....

In question **b** above, which speed was faster?

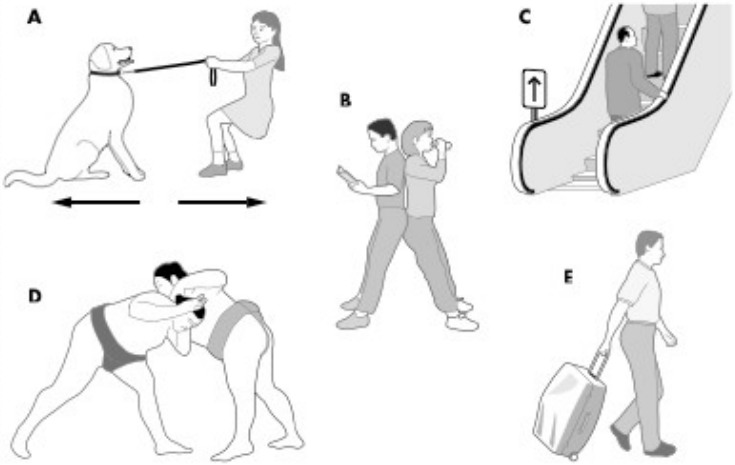
.....

continued ➤

CHAPTER 7 WORKSHEET 7

G7 Balanced and unbalanced forces (page 1)

The drawings below show examples of forces that are balanced.



When forces are **balanced**, objects either stay still, or they move with a constant speed, meaning that their speed does not change.

1 Draw two arrows on each picture to show the balanced forces. The first one has been done for you.

2 Group the pictures into **objects staying still** and **objects moving with constant speed**.
Then put the letters under the correct headings in this table.
One has been done for you.

Objects staying still	Objects moving with constant speed
D	

continued ➤

Unit 4. Energy.

1.Vocabulary:

Truck, is released, coal, fuels, radiant, empty, powerful, sources, kick, tyres, power plant, gears, non-renewable, renewable, used up, windmill, biomass.

2.Energy Comes in Many Forms

Can you imagine a world without energy? You can't play computer games, ride a bicycle, or talk on the phone. Cars and trucks can't move. Lights can't shine. Plants can't grow. Without energy, nothing can happen!

> Energy is the ability to change or move matter.

Almost everything you see, hear, and feel depends on energy. Energy comes in many forms.

Chemical energy is energy that is released by a chemical reaction. The food you eat contains chemical energy that is released when you digest your meal. Wood, coal, petrol, and natural gas are fuels that contain chemical energy. When these fuels are burned, the chemical energy is released as heat.

Radiant energy is energy that can move through empty space. The sun and stars are very powerful sources of radiant energy.

Mechanical energy moves objects from place to place. You use mechanical energy when you kick a ball or turn the pedals of a bicycle. Other examples of mechanical energy include water flowing in a stream or tyres rolling down a road.

Electrical energy comes from the electrons within atoms. It can be created at a power plant or inside a battery, and can power everything from remote-controlled cars to refrigerators.

Nuclear energy is energy contained in the nucleus at the centre of an atom. Nuclear energy is released when nuclei are split into several pieces, or when they are combined to form a single, larger nucleus.

3.Energy Can Move and Change

Energy can be transferred, or moved, from one object to another.

When you ride a bicycle, you transfer **mechanical energy** from your legs to the pedals. The pedals transfer the energy to the bicycle gears, which transfer the energy to the tyres. The rolling tyres move the bike along the street.

A light bulb changes **electrical energy** into **heat and light** energy.

Energy can be transformed, or changed, from one form to another.

4.Many Different Energy Resources Can Be Used to Make Electricity

You probably know that most of the electricity you use is produced in a power plant and travels to your home and school through special wires. But do you know what energy sources are used to run power plants?

Energy resources can be divided into two categories: non-renewable and renewable.

Non-renewable Resources

A non-renewable resource is a resource that can be used up. **Fossil fuel**, which includes coal, **oil** , and **natural gas**, are non-renewable because it took millions of years for them to form. Once we use up our fossil fuels, they will be gone for good.

Renewable Resources

A renewable resource is fairly easy to replace. Renewable energy resources include wood, wind, sunshine, geothermal energy, biomass, and water stored behind dams in lakes and reservoirs. Electricity can be produced using several kinds of renewable resources.

5.Wasted energy.

Have you noticed that when you use a computer, television or MP3 player, it gets **warm**?

- When energy is **converted** from one form to another, the **total amount of energy is conserved** (stays the same), but **not all the energy is in a form that is useful to us.**
- Usually, some of the energy is converted into **heat** and/or **sound**, which are transferred to the surroundings. If we **cannot use this energy,** we say that it is **wasted.**

Activity:

Complete the table.

	Input energy	**Useful output energy**	**Wasted energy**
Light bulb	Electrical	Light	Heat
MP5 Player	Chemical		
Car		Kinetic	
Washing machine			Sound and heat

Activities.

1.Insert these words into the following sentences to show you know what they mean.

Renewable non-renewable

Sources of energy that will be used up and cannot be replaced are ..... resources. Sources of energy that can be replaced are ..... resources.

2.You can get energy from all these energy resources.

Sugar, natural gas, moving water, sunlight (solar power), oil, wood, coal and wind. Some are non-renewable, and others are renewable. Write each one in the correct column of this table.

Non-renewable resources Renewable resources

3.Save energy at home.

Write ten different ways of saving energy at home.

4.Choose a type of energy which fits the descriptions a) to g) below.

a)The type of energy that moving objects have,..... .

b)A very useful type of energy that flows along wires. ..... .

c)A type of energy stored due to gravity and height above ground. .....

d)Luminous objects give off this energy. ..... .

e)The potential energy stored in a stretched rubber band. ..... .

f)Energy that can be released by a type of reaction. ..... .

g)Energy that noisy objects transmit. ..... .

5.We only make use of energy when it changes from one type to another. Try to work out what the "starting" energy is, and what the "finishing" energy is for each of the following. The first one is done for you.

a)A cyclist going up a hill.

Starting energy= KINETIC Finishing energy= GRAVITATIONAL POTENTIAL.

b)A burning match. .....

c)An electric light bulb. .....

d)A pop group's microphone. .....

e)Wood on a fire. .....

f)A solar cell on a student's calculator. .....

g)A windmill connected to a generator. .....

6.Relate each source of energy to the corresponding sentence.

Uranium	Oil
Coal	Sunlight
Wind	Biomass

a)A renewable energy, but not very efficient.

b)Its greatest advantage is the large amount of energy obtained from a very small quantity of fuel.

c)Its arrival on the market meant that it soon dominated all other sources of energy, such as coal.

d)It is a fossil fuel which began to be used excessively during the industrial revolution.

e)To make use of this energy windmills must be installed which incorporate a generator to produce electricity.

f)The chemical energy stored by organic waste is used.

Complementary activities.

1.Make a list of at least eight items you use that need energy as you can see in the example:

Energy-using items	Energy source	Forms of energy
Fireplace	Wood or natural gas	Chemical, radiant

2.The following words are all mixed-up names of different energy types. Unscramble the letters to find the types of energy:

a)glith **b)**tacslie **c)**duons **d)**tenpliato **e)**hamlert **f)**cleerlicat **g)**nicekti **h)**clahicem.

3.Test of maturity.

Making use of energy.

Evaluate your attitude towards saving energy.

*Do you use public transport to move around the city?

*Do you recycle waste paper by putting it in the appropriate container?

*Do you close the doors and windows when the heating or air- conditioning is on?

*Do you turn off the lights when you leave a room or public toilets?

*Do you make use of natural light rather than turning on the lights?

*Do you turn off the computer or the printer when you are not using them?

*Do you turn off the television when you are not watching it?

*Do you put a lid on the saucepans when are you cooking?

Now analyse your answers. Give yourself one point for each positive answer. If you have less than 4 points, you should look again at your behaviour so that you can make better use of energy. Which attitudes should be improved in your class?

4.Play this game: http://www.energyquest.ca.gov/wattsthat_junior/namethis/index.html

Unit 5. Heat and temperature.

1.Vocabulary:

To release heat, to absorb heat, Celsius scale, Fahrenheit scale, conduction, convection, radiation, rod, cool, cooler, hot, hotter, conductors, insulators, waves, dilation, melt.

2.Heat is energy in transit.

When two bodies at different temperatures make contact, heat passes from the one that is at a higher temperature to the one that is at a lower temperature. Therefore, there is a transfer of energy. One body releases heat (and its temperature decreases), and the other body absorbs heat (and its temperature increases).

3.Heat is not the same as temperature.

-Heat is a form of energy. It can be transformed, for example, into kinetic energy or luminous energy.

-Temperature is a physical magnitude that is related to the amount of heat that can be released or absorbed by a body. Temperature can be measured using various temperature scales: Celsius, or centigrade scale (the most widely used), Fahrenheit scale (used principally in Anglo-Saxon countries) and Kelvin or absolute scale (used in science). These temperature scales are related with the following equations:

$$\mathbf{T_F = 1.8 \cdot T_C + 32}$$

$$\mathbf{T_K = T_C + 273} \qquad \mathbf{T_C = T_K - 273}$$

Temperature measures how hot something is. The hotter it is, the higher the temperature.
Heat is a form of energy. Heat flows from hotter objects to cooler objects.

Activities.

1.Write down the temperatures using the different scales and fill in the table.

Temperature (ºC)	**Temperature (ºF)**	**Temperature (K)**
25		
		300
-215		
	-148	
0		
	0	
		0

2.Where does heat flow:

1. if you open the door of a hot oven?
2. If you open the door of a fridge?

4.The propagation of heat.

Heat moves from hot places to cooler places. Sometimes we want this to happen, sometimes we do not. If we understand the different ways in which heat can move, we can take steps to improve this movement or prevent it.

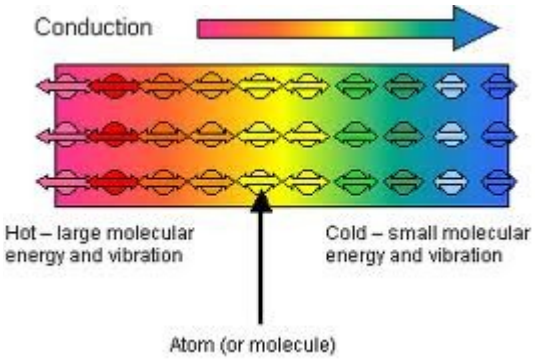
Three ways in which heat can move are by: conduction, convection and radiation.

Conduction. The propagation of heat by conduction occurs in solids. When we have a rod in a fire, the atoms of the rod that are in the fire become hot. They vibrate more violently. These atoms transfer heat to the cooler end of the rod and it also becomes hot. After five minutes the whole length of this metal rod is hot. Heat has travelled along the rod by **conduction.**

But not all solids propagate heat to the same extent.

-Solids, which transmit heat well, such as metals, are *conductors*.

-Solids, which transmit heat badly, such as wood and many plastics, are *insulators*.

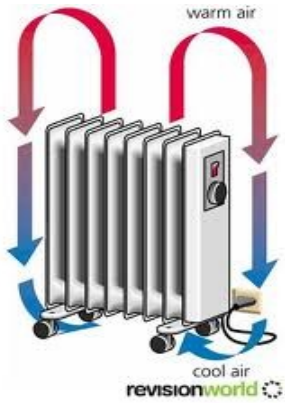


Conduction can also occur in
liquids and gases, but it happens much more slowly, because the particles are further apart and they don't touch each other as often.

Activity.

3.Why do woollen hats keep your head warm?

Convection. The propagation of heat by convection occurs in liquids and gases. When air is warmed it rises. This movement of air can be used to transfer heat from place to place. It is an example of convection current.



Activities.

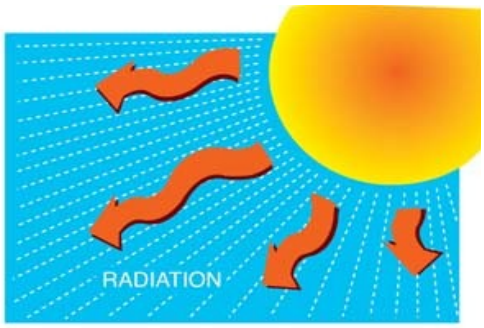
4.What happens to air when it is warmed?

5.What happens to air when it cools?

6.Where is the warmest air in a room?

Radiation. Radiation is the movement of heat by waves. These waves have several different names. They may be called *thermal radiation*, *electromagnetic waves* or *infrared waves.*

Particles have to be present if heat is moving by conduction or convection. Heat that is being carried by radiation does not need any particles. The Sun transfers heat by radiation.



Activities.

7.Which gives out most radiation, a hot object or a cold object?

8.Say how heat is propagated in the following situations:

	Conduction	**Convection**	**Radiation**
Boiling water			
Iron			
Spoon			
Toaster			
Radiator			

9.When two material systems at different temperatures come into contact, heat is passed from the one that is at a higher temperature to the one that is at a lower temperature. Until when?

10. Complete the following sentences.

-..... is a form of energy that passes from one body to another when there is a difference in ..... .

-Heat can be propagated in three ways: by ..... , by ..... or by ..... .

-The materials which conduct ..... well are called ..... , and those that conduct heat badly are ..... .

Complementary activities.

1.A. The words of each of the following groups are related. Write a sentence using the words, explaining some of the concepts studied in this unit.

a)heat-temperature.

b)heat-change of state.

c)heat- dilation.

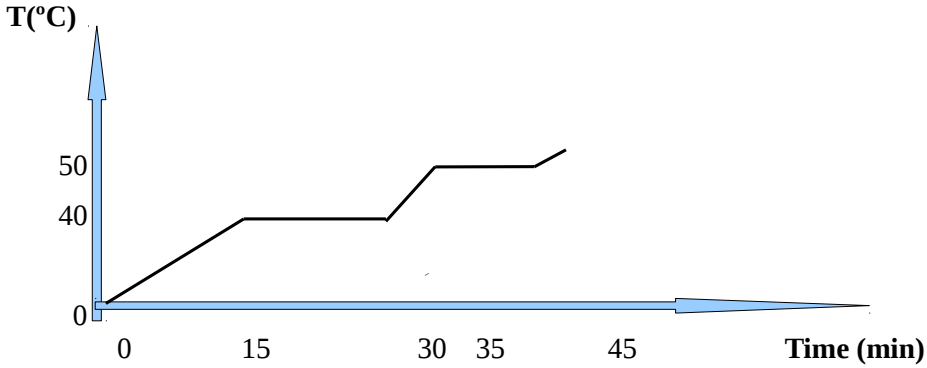
d)heat-conduction-convection-radiation.

e)temperature-Celsius scale-Fahrenheit scale-Kelvin scale.

f)heat-conductors-insulators.

2.A. When the temperature of a body increases by 1ºC, does it also increase by 1K? Does it increase by 1ºF? You can write an example to explain your answer**.**

3.A. Look up the following graph corresponding to the heating of a substance. You will see the time is represented on the horizontal axis and the temperature on the vertical axis.



-Identify the changes of state.

-At what temperature does the solid change to liquid? And when does the liquid turn to gas?

-How long does it take for the substance to melt? How long does it take for all the liquid to evaporate?

-What state is the substance in ten minutes after it has started to be heated?

4. Go to www.bbc.co.uk/schools/bitesize; then click on KS2, science, materials and finally on keeping warm. Do the quiz.

The following activities are to reinforce what you have learnt.

CHAPTER 8 WORKSHEET 3

H3 Conducting and insulating materials

Metals conduct heat well. They are **conductors**.
Non-metals, like wood, do not conduct heat well. They are **insulators**.

1 Look at the drawings of soup being stirred.

A

B

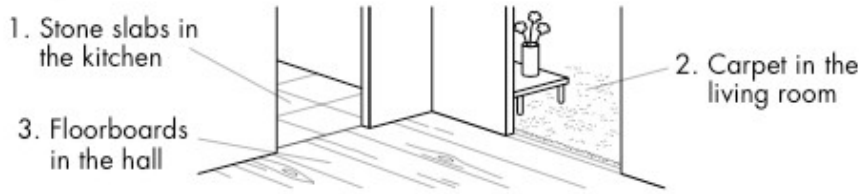
a Which hand, **A** or **B**, will get warm first? .....

b To explain your answer to question **1a**, circle the correct answer to complete these sentences:

Heat energy flows faster through the **wooden** / **metal** spoon.

We say that **wood** / **metal** is a better **conductor** of heat.

2 A girl likes walking around her home in bare feet. These are the **types of floor** in different rooms.



In the questions below, circle the correct answer.

Which type of floor is the:

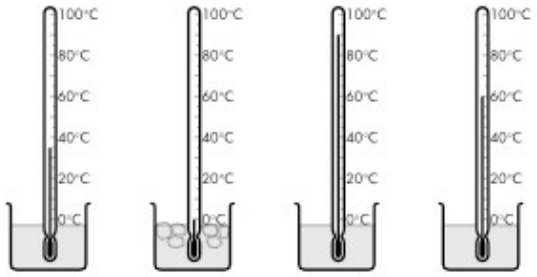
a **best insulator** of **heat energy**? **1 / 2 / 3**

b **worst insulator** of **heat energy**? **1 / 2 / 3**

CHAPTER 8 WORKSHEET 1

H1 How a thermometer measures temperature

1 A **thermometer** measures how **hot** or **cold** its surroundings are. Read the thermometers **A** to **D** below, and write down the temperature of the water in each beaker.



The temperature of the water is: ..... °C ..... °C ..... °C ..... °C

2 a What is the **scale of temperatures** on the thermometers?
The **temperature scale** is from ..... °C to ..... °C.

b The boiling point of water is 100 °C. Is the **water in beaker C** hotter or colder than boiling water?
hotter / **colder**

3 To explain how a thermometer measures temperature, complete the passage below with these words:

hotter **temperature** **cooled** **stops**

Liquids **expand** (get bigger) when heated, and **shrink** (get smaller) when they are ..... .

When a thermometer is moved from a **cold place** to a ..... **place**, the liquid in the thermometer **expands** and moves up the tube.

When the liquid ..... moving, the reading on the thermometer tells you the ..... of the place it is in.

Unit 6. Light and sound.

Vocabulary:

Ultraviolet, infrared, switch on, in no time at all, thunderstorm, thunder clap, straight, bend, opaque, brick, transparent, translucent, luminous, shadow, shiny, dull, rainbow, string, drumskin, diaphragm, loudspeaker, cords, vacuum, scream, echoes, loudness, amplitude, louder, pitch, frequency, hertz.

1.What is light?

Light is produced by luminous objects, such as fires, electric lamps and stars like the Sun. The light that we can see is called **visible light**, but there is also light that we cannot see, including ultraviolet light and infrared light.

Extremely fast

If you switch on an electric lamp, the light seems to come on instantly. However, the light doesn't reach your eyes immediately. It only takes a short time, because light travels extremely quickly. Light travels much faster than sound, which is why you see lightning in a thunderstorm before you hear the thunder clap.

Straight lines

Light travels in straight lines. It cannot bend around corners, so we cannot see around a corner unless we use a mirror.

2.Light and objects

Light cannot travel through opaque objects, such as brick walls. Light travels through transparent objects, such as glass windows. Paper and other translucent objects let some light through, but not all of it. This is why you can see the typing on the other side of a piece of printed paper if you hold it up to a light.

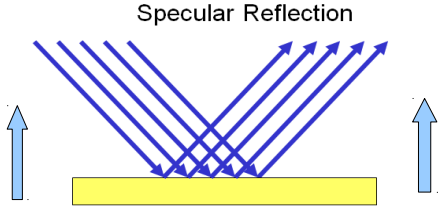
Light can travel through a vacuum such as space, but sound cannot. Science fiction films often show explosions in space with loud bangs. In real life, you can see the explosion but not hear it.

3.Reflection, refraction and dispersion

3.1. Reflection. Rays of light **reflect** off non-luminous objects. How they reflect depends on the surface of the object:

Smooth surface like mirrors:

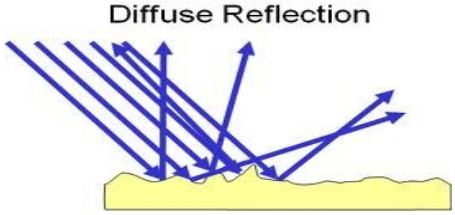
- all the light reflects in the same directions
- the surface looks clear and shiny



Incident rays
reflected rays

Rough surfaces:

- The light reflects in different directions
- the surface looks dull or matt



3.2.Refraction. Light can travel through any **transparent medium** (eg. Air, glass, water), but it goes at a **different speed in each medium**.

- When light passes from one transparent medium to another it changes speed.

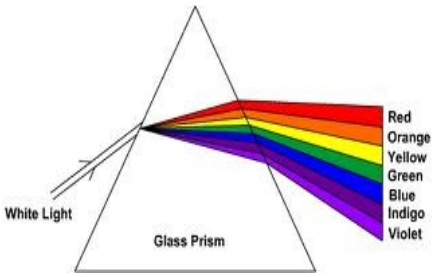
- When it changes speed it also changes direction: this is called **refraction.**

3.3.Dispersion.

White light is light that seems to have no colour, like sunlight.
However, white light is really a **mixture of different coloured lights.**

- If white light passes through a <u>prism</u>, it splits up into the different colours.
- <u>The splitting up of light</u> in this way is called **dispersion.**
- The range of colours is called **spectrum.**

Dispersion happens because each colour is refracted by a different amount.



Activities.

1.Complete these sentences by filling in the missing words:

a) Light travels in S..... lines.

b) Light travels as a type of electromagnetic R..... .

c) Light travels at a speed that is much F..... than that of sound.

d) The speed of light in a vacuum is ..... m/s.

e) You can see through some things. These are said to be T..... .

f) Some things just don't let light through at all. These are called O..... materials.

g) Some things give out their own light. These are said to be L..... .

h) We see all other things because they R..... light.

i) For us to see something, light from it must enter our E..... .

j) Areas where light can't reach because something is in the way are called S.....

2.Look at the diagram of dispersion:

- Which colour of light refracts the most?
- Which colour refract the least?

3.Choose suitable words to describe each of the things listed a) to i). You may find that more than one word will fit.

OPAQUE, TRANSPARENT, SHINY, LUMINOUS, DULL, TRANSLUCENT.

a) A window.....

b) A mirror.....

c) The Sun.....

d) The Moon.....

e) Air.....

f) Greaseproof paper.....

g) Water.....

h) Carpet.....

i)Aluminium foil .....

4.Complete the following sentences using the box of words below.

REFLECTS ABSORBS RED BLUE GREEN

A post box is red because the paint on it ..... red light and ..... all the other colours. A dandelion appears yellow because it absorbs ..... light but reflects ..... and ..... light.

5.Mick is looking at different coloured light. The table is only partially complete. Fill in the missing words to complete the table.

Colour cube	Colour light	Colour cube seem to be
----------	Red	Red
	Blue	Blue
	Green	Green
Red	Red	.....
	.....	Black
	Green	.....
Blue	.....	Black
	.....	Blue
	Green	.....
.....	Red	Red
	Blue	Black
	Green	Green
Green	Red	.....
	Blue	.....
	Green	.....

4.What is sound?

Sound is produced whenever an object vibrates. The object could be a string on a guitar, a flat surface such as a drumskin, the diaphragm in a loudspeaker, or even your vocal cords.

Sound transfers energy away from the vibrating object, and it needs something to travel through. Sound cannot travel through a vacuum - in space, no-one can hear you scream!

5.Speed of sound

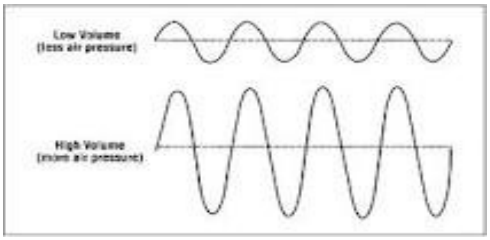
Sound travels at different speeds through different substances. In general, the denser the substance, the faster sound travels through it. Sound travels at 5100 m/s through steel, 1480 m/s through water and 330 m/s through air. This is much slower than the speed of light.

6.Echoes

Sound can **reflect** from the surface of an object. This is called an **echo**. Hard surfaces reflect sound better than soft surfaces, which is one reason why classrooms without carpets or curtains can be noisy places.

7.Loudness

The loudness of a sound depends upon the **amplitude** of the vibrations that cause it. Big vibrations transfer more energy than small vibrations, so they are louder.



8.Pitch

A sound can range from a high to a low pitch. The pitch of a sound depends upon the **frequency of the vibrations** that cause it. The frequency of a sound is the number of complete waves or vibrations that pass a particular place each second:

- if there are lots of vibrations per second, the frequency is high and the sound has a high pitch; and
- if there are few vibrations per second, the frequency is low and the sound has a low pitch.

Frequency is measured in hertz (pronounced "hurts"), with the symbol Hz.

Activities.

6.Put a tick in the box next to your answer.

6.1. Approximately how fast does sound travel through the air?

-330 km/h

-330 mph

-330m/s

6.2. What is sound unable to travel through?

-Thick walls.

-A vacuum.

-Water.

6.3. Sounds with a large amplitude are:

-Loud.

-High pitched.

-Low pitched.

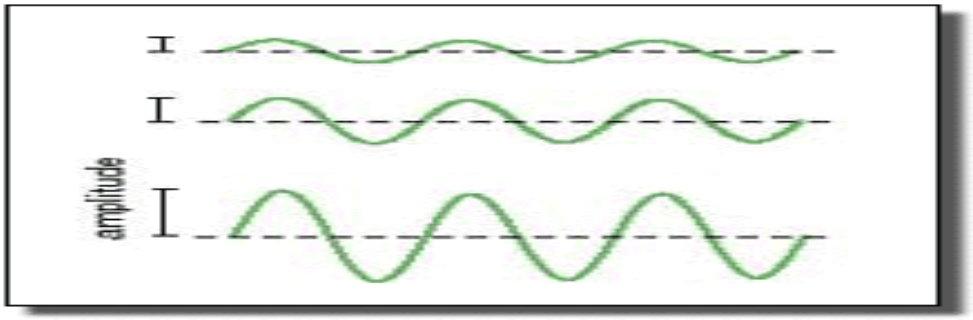
6.4. Frequency is measured in:

-Hz

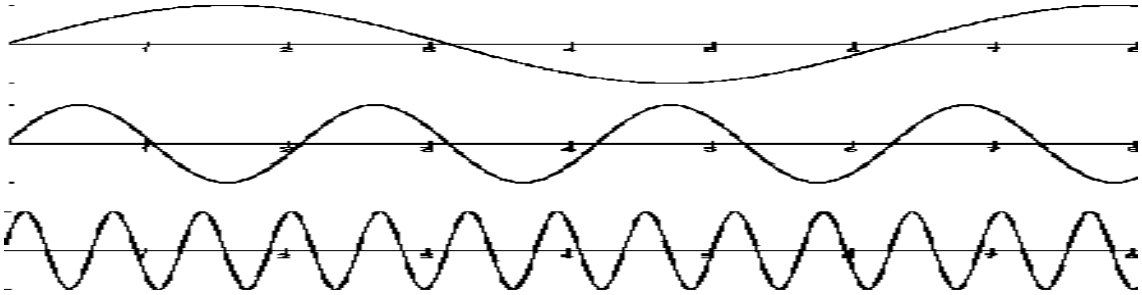
-Fm

-Fr

6.5. Which line shows the quietest sound?



6.6. Which line shows the sound with the highest pitch?



Complementary activities

1.Just for fun, go to bbc, children, games, school game, 7-8 science (there's a game a test about Light and shadow)**.**

2.Make your own rainbow:

Try this experiment on a sunny day.

You will need: a shallow dish of water, a small mirror, a piece of paper.

1º Put the dish of water next to a window and put the small mirror into it so that the mirror faces the Sun. Do not look into the mirror.

2º Hold the piece of paper above the dish and move the mirror so that the light reflected off the mirror shines onto the paper. What colours do you see on the paper? Does it look like a rainbow in the sky?

3º If you can, make a photo, so your classmates will see you have done the experiment.

3.Find a shiny spoon and look at your reflection in both sides.

For each side (convex and concave), write down:

- is the image right way up or upside down?
- Is the image distorted (different from your shape in real life?

4.Work in groups to discuss this questions. Then present your group's opinions to the rest of the class.

1. Do you ever get annoyed by noise at home or at school?
2. What kind of noises annoy you? How do you think these noises could be reduced?
3. Do you regularly listen to an MP3 player? For how many hours a day? How high do you set the volume (high, medium or low)? Do you think this could affect your hearing?

CHAPTER 6 WORKSHEET 1

F1 How objects produce sounds

1 Look at the drawing to see how you hear a bell ring.

Silent bell | Bell is hit and it vibrates | Sound travels through air to ear

Read the passage, then cut out the phrases below and join them to make sentences.

When you hit a bell, the metal of the bell **vibrates** and the bell rings. The vibrating bell makes the **air** round it vibrate. These vibrations **travel** through the air. We hear the sound when the **vibrations** in the air reach our **ears**.

1. When a bell is hit, ...	... through the air.
2. The vibrations in the metal ...	... the metal of the bell vibrates.
3. The vibrations travel...	... get to our ears, and we hear the bell ring.
4. The vibrations in the air...	... are passed on to the air round the bell.

2 Complete this sentence by underlining the correct ending.

We hear a **bell ringing** because...

... we hear the **vibrations** in the **bell**.

... we hear **vibrations** that reach us through the **air**.

3. Do the test you can find in: bbc, children, school secondary 11-16 science.