# Physics Revision Guide

Normanhurst School

Year 8

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## Heating & cooling

**Thermometers**

- Thermometers contain a liquid e.g. mercury
- When heated the liquid expands
- The liquid is forced to rise up a narrow tube
- Because the tube is narrow it rises more.

The Celsius scale is based on 2 fixed points: the Lower Fixed Point (LFP) and the Upper Fixed Point (UFP) with 100 divisions between them:

- The LFP is the freezing point of water (0°C)
- The UFP is the boiling point of water (100°C).

This is how all thermometers are calibrated.

**The movement of heat**

There are 3 ways of moving heat:

- Conduction – heat moving through a material (solid, liquid or gas)
- Convection – heat moving because the fluid (liquid or gas) is moving.
- Radiation – also called heat radiation or infrared radiation.

**Conduction in metals**

- Metals are good conductors
- Metal atoms are held tightly together
- When some atoms are heated they vibrate more
- These vibrations pass on to neighbouring atoms
- The vibrations (heat) move through the metal.

**Conduction in liquids:**

- Particles are close but can move
- Vibrations are not easily passed on
- Liquids are poor conductors.

**Conduction in gases:**

- Particles are very far apart
- Vibrations very hard to pass on
- Gases are very poor conductors.

**Insulators**

- Air (gas) is a very poor conductor
- Any material that traps air in small pockets is a good insulator.

Good insulators:

- Fur, feathers, woollen clothes
- Double glazed windows, bubble wrap.

**Expansion & contraction**

- When heated the particles take up more room
- The material expands
- Metals expand most when heated
- Some metals expand more than others
- Thermostat controls use a bimetallic strip.

**Convection**

- When liquids & gases are heated, they expand
- The particles take up more room (volume)
- As the volume increases the density decreases
- Less dense fluids will move upwards
- Colder, more dense fluids will move down
- This process is called convection.

**How things cool down**

- Heat always moves from hot to cold
- The greater the temperature difference the greater the rate of heat movement
- At first the object cools down quickly
- As the temperature difference decreases the rate of cooling decreases
- This leads to the Cooling Curve.

## Magnets & magnetism

**Magnetic materials**

- Iron, cobalt and nickel are magnetic materials
- Magnets produce a force – push or pull
- We say that magnets produce a magnetic field
- Iron is a very common element
- Iron atoms are tiny atomic magnets.

**North & South poles**

- A compass is a magnet on a pivot
- One end points to the North of the Earth
- We call this end the North Pole
- The other end is the South Pole.

**The rules of magnetism**

- North pole repels north pole
- South pole repels south pole
- North pole attracts south pole
- A compass points away the north pole of a magnet
- A compass points towards the south pole of a magnet.

**Magnetised iron: the tiny atomic magnets line up:**

- This makes the magnetism very strong
- This produces a large external magnetic field

**Demagnetised iron: the tiny atomic magnets are jumbled up:**

- The atomic magnets cancel each other out
- There is no external magnetic field.

**Iron is magnetically soft:**

- Iron is pure (an element)
- Iron is easy to magnetise
- Iron easily loses its magnetism.

**Steel is magnetically hard:**

- Steel is a hard alloy
- Steel is difficult to magnetise
- Once magnetised, it keeps its magnetism.

**Two ways to make a steel magnet:**

- Stroke it in one direction with a magnet
- Put it inside a coil carrying DC current.

**Three ways to destroy a magnet:**

- Hit or drop the magnet repeatedly
- Heat it red hot
- Put it inside a coil with AC current and slowly remove.

**Seeing the invisible**

- A magnetic field is invisible
- We can feel the force on other iron objects
- Sprinkle iron filings to see the shape of the field
- Plot the field with a compass.

**The Earth's magnetic field**

- A compass points North because of the Earth's magnetic field
- This magnetic field surrounds the Earth
- At the North of the Earth is a South Magnetic Pole
- Earth's magnetism protects us from particles from the Sun.

## Electromagnets

**Magnetism from electricity**

- An electric current produces a magnetic field
- A wire carrying a current has a circular magnetic field around it
- When the wire is coiled, the magnetism is increased.

**The electromagnet**

There are 3 ways to increase the magnetism in an electromagnet:

- Increase the current
- Increase the number of turns in the coil of wire
- Put an iron core inside the coil.

**Uses of electromagnets**

- Relays (remote electrical switches)
- Circuit breakers (fuses)
- Electric bell
- Electric motors.

## Light

**Light rays**

- Light travels in straight lines
- Lines of light are called rays
- We use ray diagrams to describe and explain what happens with light.

**Transparent:**

- Light goes through a material unaltered
- You can see clearly through a transparent material.

**Translucent:**

- Light goes through a material but is scattered
- You cannot see through a translucent material.

**Opaque:**

- Light will not go through an opaque material.

**Reflection:**

- Light bounces off a reflective surface.

Mirrors:

- Light reflects in an orderly way
- Angle of incidence = angle of reflection.

Paper:

- Light reflects in a disordered, jumbled way.

**Refraction**

- Light bends when it goes in or out of glass or water
- Going in, it bends towards the Normal
- Coming out, it bends away from the normal.

Note: a Normal line is a line at right angles to the surface.

**Prisms & lenses**

Prism (triangular glass block):

- Refracts white light
- Splits white light into colours (dispersion)
- The colours are called the Spectrum

Convex lens:

- Produces an image of a scene
- Convex lenses are used in microscopes, cameras and the eye.

**Colours of the Spectrum**

- Red
- Orange
- Yellow
- Green
- Blue
- Indigo
- Violet.

**Primary colours for TV & cinema:**

- Red
- Green
- Blue
- All three produce white light.

**Secondary colours for printing & art:**

- Magenta
- Cyan
- Yellow
- All three produce black.

**The eye**

Know the parts of the eye & their function:

- Lens
- Pupil
- Iris
- Retina
- Optic nerve.

## Sound

**Sounds**

- Sounds are vibrations
- They travel as pressure waves
- Sounds can travel through solids, liquids & gases.

**Describing sounds**

- Sounds have a loudness or amplitude
- Loudness is measured in decibels (dB)
- Sounds have a pitch or frequency
- Frequency is measured in Hertz (Hz)
- 1 Hz = 1 oscillation or vibration per second.

**The speed of sound in different materials:**

- Air – 300 m/s
- Water – 1500 m/s
- Steel – 6000 m/s

The more dense the material the larger the speed of sound.

**The reflection of sound: echoes**

- Sounds reflect off solid objects
- Sound reflections are called echoes.

Echoes have many uses:

- Bats use echo location to find food and obstacles while flying
- Ships use echoes to calculate the depth of the sea.

**Stringed instruments**

The frequency (pitch) is made higher by:

- Using a tighter string (higher tension)
- A shorter string
- A thinner string.

Loudness is affected by how hard the string is plucked.

**Wind instruments**

The frequency (pitch) is made higher by:

- Using a shorter tube

Blowing harder makes the note higher.

**Ultrasound**

- The highest frequency people can hear is 20,000 Hz
- Sounds above 20,000 Hz are called ultrasound.

Ultrasounds have several uses:

- Scans of a baby in the womb
- Cleaning teeth at the dentist
- Checking materials for defects (cracks)
- Breaking up kidney stones.

**The ear**

Know the names and function of the 3 sections of the ear:

- Outer ear
- Middle ear
- Inner ear.