

Hoërskool Birchleigh



Grade 9 Natural Sciences

Term 3 Notes

# Day 1



## Topic 1.1: Types of forces



- ✓ Let's learn Terminology!

**Force:** A **push** or a **pull** that takes place when two objects **interact**.

**Newton (N):** the **unit of measurement** for **forces**.

**Friction:** the **force** that **acts** between two **objects rubbing** together.



- ✓ Let's Read!

Read through pages 118 to 120 in your textbook.



- ✓ Let's sum it up!

What is a **force**? A **force** is a **push** or a **pull** that acts on an **object**.

**Contact forces** require two objects to **touch** in order for the forces to **act** on the objects. Example: **pushing** or **pulling** a chair.

**Field forces** (non-contact forces) **act** on **objects** at a **distance without** the objects **touching** each other. Example: **gravity** or **magnetic** forces.

All **forces** are **measured** in **Newtons (N)**.

Forces can affect objects in a number of ways:

**Shape:** Forces can **compress** or **stretch** an object.

**Speed:** Forces can **speed up** or **slow down** an object.

**Direction:** Forces can **change** the **direction** an object moves in.

There are different types of forces:

- **Friction:** The **force** that **acts** between two objects **rubbing** together. Friction can **slow down** a moving object or **prevent motion** completely.

- **Tension:** The **force** that **acts** when an object is **pulled** and is **stretched**.

- **Compression:** The **force** that **acts** on an object when it is **pushed** and is **compressed** (squashed).



✓ Did you understand the work?

1. For the following examples, state whether the force is a contact force or a field force.

- 1.1. A rubber band is stretched (1)
- 1.2. Paper is folded in half (1)
- 1.3. A ball is dropped and falls back to earth (1)
- 1.4. A soccer ball is kicked (1)
- 1.5. Two magnets move towards each other (1)

2.1. For the following examples, state whether the force is a friction, tension or compression force.

- 2.1. A nail is hammered into a plank (1)
- 2.2. A rope is pulled (1)
- 2.3. Rubbing your hands together (1)
- 2.4. A soccer ball is kicked (1)
- 2.5. Sandpaper is rubbed on wood (1)

**[10]**

## Day 2

### Topic 1.2 Gravitational force, weight and mass



- ✓ Let's learn Terminology!

**Gravitational force**: the **field force** that **pulls matter** together.

**Weight**: the **gravitational force** that the **Earth exerts** on an **object**, measured in **newtons (N)**.

**Mass**: the **amount of matter** in an **object**, measured in **kilograms (Kg)**.



- ✓ Let's Read!

Read through pages 121 to 123 in your textbook.



- ✓ Let's sum it up!

A **gravitational force** is a **field force** that **pulls matter** together. The **magnitude** of the **gravitational force** between two objects depends on the **mass** of the object. The **heavier** the object is, the **greater** the gravitational force. It also **increases** as the objects **move closer** together.

All objects **exert** a **gravitational force** on objects around them. The **Earth** exerts a **gravitational force** on the objects on its **surface**. You also **exert** a **small gravitational force** on the **objects** around you.

#### **Weight and mass:**

The **gravitational force** that an object **exerts** on objects around it is called the **weight** of the object, and is measured in **newtons (N)**.

The **mass** is the **amount of matter** in the object, and is measured in **kilograms (kg)**.

The **mass** of an object **remains the same** no matter where it is because the **amount of matter** in the object **doesn't change**.

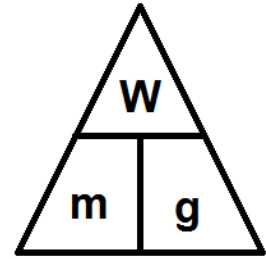
The **weight** of an object will **change depending** on the **gravitational force** exerted on it. An astronaut **weighs less** on the moon compared to on Earth because the moon has a **weaker gravitational force**. The Earth's **gravitational force** is  $9.8 \text{ m.s}^2$ , meaning that a 1kg object has a weight of 9.8N.

The formula for calculating weight:  $W = m \times g$

W = weight (N)

m = mass (kg)

g = gravitational force ( $m.s^2$ )



For example: Calculating the weight of a 2kg object on the Earth.

$$W = m \times g$$

$$W = 2 \times 9.8$$

$$W = 19.6 \text{ N}$$



✓ Did you understand the work?

1. For each of the following pairs of objects, state which of the following objects exerts a greater gravitational force:

1.1. The sun or the earth (1)

1.2. The earth or the moon (1)

1.3. A car or a human (1)

1.4. A human or a cat (1)

2. Name two factors that affect the gravitational force between two objects.(2)

3. Calculate the weight for a 5kg object on Earth, which has a gravitational force of  $9.8m.s^2$ . (2)

4. Calculate the mass of an object that weighs 196N on Earth. (2)

**[10]**

## Day 3

### Topic 1.4 Magnetic force

- ✓ Let's learn Terminology!

**Magnet:** An object or material that **produces** a **magnetic field**.

**Magnetic field:** the **space** around a **magnet** where a **magnetic material** will experience a **force**.

- ✓ Let's Read!

Read through pages 123 to 126 in your textbook.

- ✓ Let's sum it up!

A bar **magnet** hanging from a string will always come to **rest** with **one end** pointing **towards** the **north** and is called the **north pole** (N-pole). The other end points towards the **south** (S-pole).

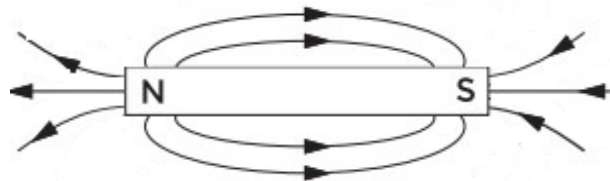
If we move magnets towards each other, the magnets will move.

**Opposite poles** attract, so if you move a N-pole towards a S-pole they will **attract** (move closer).

**Like** (same) **poles** repel, so if you move a N-pole towards a N-pole or an S-pole towards a S-pole they will **repel** (move away).

Magnetic fields:

A **magnet** is **surrounded** by a **magnetic field** – the space around a magnet where magnetic material will **experience** a **force**. **Magnetic fields** are represented by **drawing lines** that **start** and **end** at the **poles** of the magnet, but **DO NOT** touch or cross. The lines are drawn **closer** to show **stronger** magnetic forces and **further apart** to show **weaker** magnetic forces. The **magnetic field** flows from the **N-pole** to the **S-pole** of the magnet.



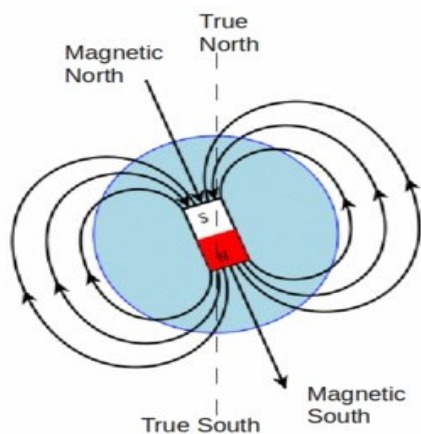
The **metals** that are **magnetic** are **iron**, **nickel** and **cobalt** which means that they are **attracted** to magnets.

Non-metals are not magnetic.

**Magnetic forces** can **act through** materials that are **not magnetic**, but **cannot** act through **magnetic materials**. This is why sensitive metal instruments, like watches have a metal casing: to protect the gears from being affected by magnetic forces.

### The Earth's magnetic field:

The Earth is **surrounded** by a **magnetic field** that is created by the planet's core. The directions given by a **compass** are called **magnetic north** and **magnetic south**. Because the Earth's axis is tilted, these are not the same as **true north** and **true south** which are **geographic locations**.



✓ Did you understand the work?

1. Complete the following sentences by filling in the missing terms.

1.1. Opposite poles of magnets \_\_\_\_\_ . (1)

1.2. Like poles of magnets \_\_\_\_\_ . (1)

2. State whether the following elements are magnetic or non-magnetic:

2.1. Carbon (1)

2.2. Iron (1)

2.3. Sodium (1)

2.4. Nickel (1)

2.5. Lithium (1)

3. Explain the difference between true north and magnetic north. (3)

## Day 4

### Topic 1.5 Electrostatic forces

✓ Let's learn Terminology!

**Electrostatic charge:** Electric charges that are **not moving** (at rest).

**Proton:** A **positive** particle in an atom.

**Electron:** A **negative** particle in an atom.

✓ Let's Read!

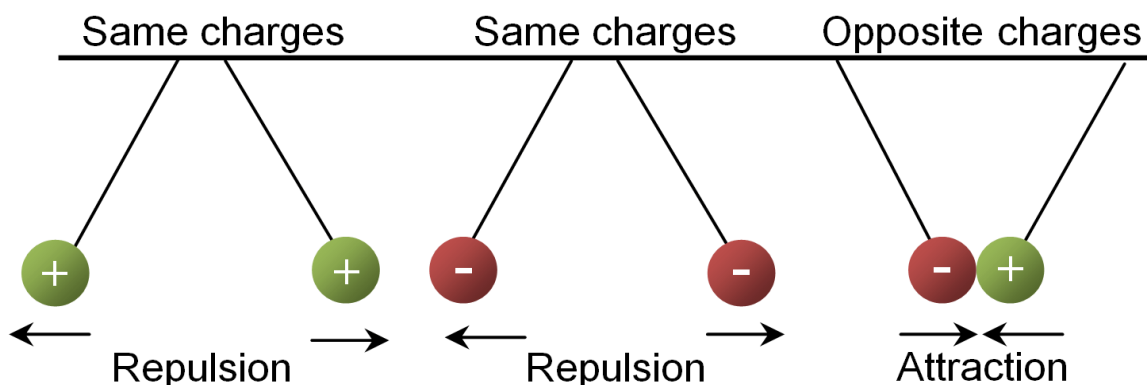
Read through pages 127 to 129 in your textbook.

✓ Let's sum it up!

**Electric charges** that are **not moving** are called **electrostatic charges** (static – not moving).

**Atoms** have **equal** numbers of **protons** (positive charge) and **electrons** (negative charge) in them. **Rubbing** two different substances together can **transfer energy** to the **electrons** and cause them to **move** from the one substance to the other. **Protons** are in the **nucleus** and **cannot move**.

If you rub your ruler against a cloth, **electrons move** from the ruler to the cloth. This causes the ruler to be **positively charged** because it has **lost electrons**. The cloth becomes **negatively charged** because it has **gained electrons**.



Two objects that have **like charges** will **repel**, while two objects with **opposite charges** will **attract**.



**Insulators** are materials that **don't** allow **charges** to **move** through them **easily**, such as glass and rubber.

**Conductors** are materials that **allow charges** to **move** through **easily**, such as copper and gold.

**Lightning:**

In a thunderstorm, strong air currents cause ice particles high up in the storm clouds to rub against the air. The **friction** causes the particles to **share electrons** and become **charged**. The charge builds up on a cloud and then jumps to another cloud - lightning. This quick flow of charge heats the air causing sound shockwaves - thunder.

✓ Did you understand the work?



1. State whether the following substances are insulators or conductors:

- 1.1. Plastic (1)
- 1.2. Copper (1)
- 1.3. Rubber (1)


2. State whether the following items will be positively or negatively charged:

- 2.1. A ruler that is rubbed with a cloth and loses electrons. (1)
- 2.2. A balloon that is rubbed with a cloth and gains electrons. (1)

**[5]**

## Day 5

### Revision Exercise for Week 1

 Complete the following exercises in your workbook to revise the work covered in Week 1.

#### Question 1

State whether the following forces are contact forces or field forces.

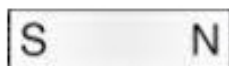
- 1.1. A ball falling to the floor. (1)
- 1.2. A car is pushed to start the battery. (1)
- 1.3. Chalk is used to write on a chalkboard. (1)
- 1.4. A nail is pulled towards a magnet. (1)
- 1.5. A positively charged ruler attracts pieces of paper. (1)

#### Question 2

- 2.1. An astronaut has a mass of 100kg. Calculate his weight on Earth and on the moon, which has a gravitational force of  $1.6\text{m.s}^2$ . (4)
- 2.2. Calculate the mass on a block on Earth that has a weight of 490N. (2)

#### Question 3

- 3.1. Draw the pattern of the magnetic field around the magnet below. (2)



#### Question 4

State whether the following objects will attract or repel each other.

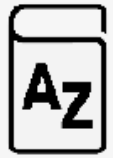
- 4.1. Two positively charged pieces of paper. (1)
- 4.2. A negatively charged polystyrene ball and a positively charged ruler. (1)

**[15]**

# Day 1



## Topic 2 Electric cells as energy systems



✓ Let's learn Terminology!

**Cell:** a device that **produces electricity** through **chemical reactions**.

**Volt (V):** the unit of measurement of the **energy** that a **cell** can **produce**.



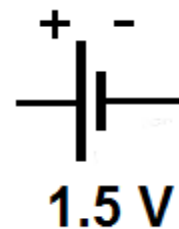
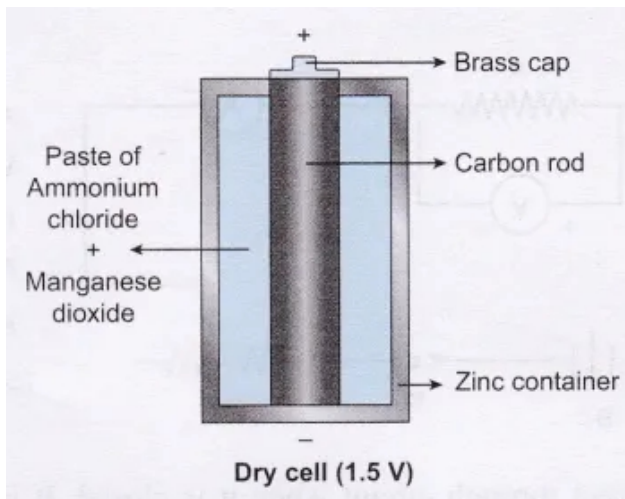
✓ Let's Read!

Read through pages 130 to 133 in your textbook.



✓ Let's sum it up!

We use **cells** to **produce** electric **current**. This is done when the **substances** in the cell **react** and **separate** positive and negative **charges** so that one terminal has an **excess** of **electrons** (negative terminal). The other terminal has a **shortage** of **electrons** (positive terminal). All cells consist of two metal terminals connected to the reacting substances. Between them is a conducting paste that allows **charges** to **flow** through the cell when it is **connected** to a circuit.



The **amount** of **energy** that a cell can **produce** is called the **potential difference** or **voltage**. It is measured with a **voltmeter** and is measured in **volts (V)**.

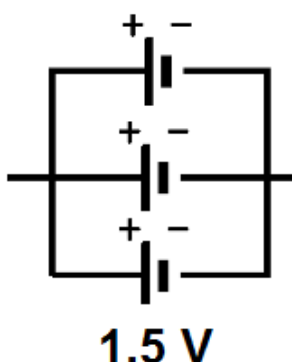
**Current flows** from the **positive terminal** of the cell **through the circuit** to the **negative terminal** of the cell.

A **battery** is made by **connecting multiple cells**. The cells can be connected in two ways:

-**Series:** Voltage **adds up** to give **more energy** to the charges that it pushes through the circuit. Using series in a circuit provides **more power** to the circuit, but if **one cell stops working** the **circuit will stop** working.

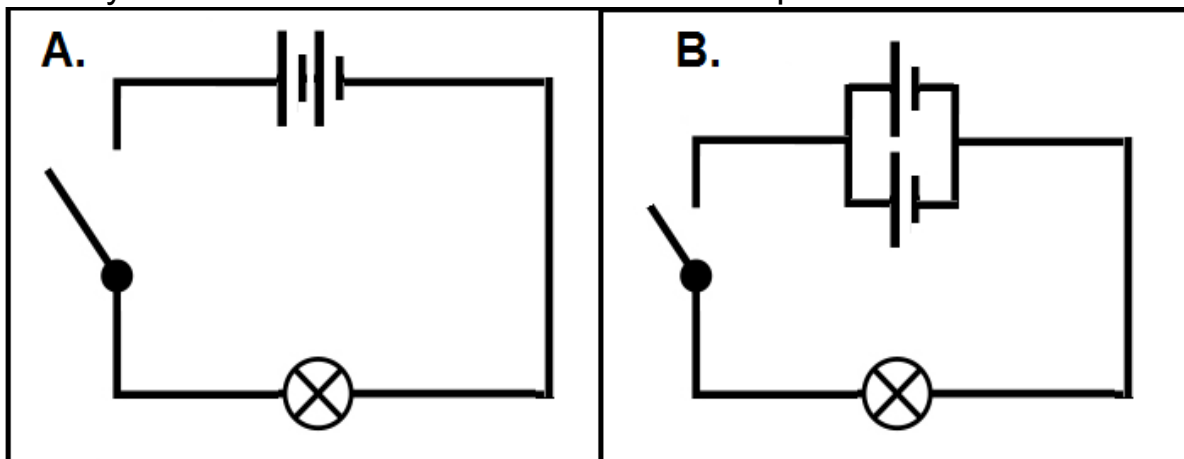


-**Parallel:** Voltage is equal to the **total** of the **cells** (the sum) **divided** by the **number** of **cells**. The cells **last longer** but only produce a fraction of the current.



✓ Did you understand the work?

1. Study the two circuits below and answer the questions that follow:



1.1. Which of these circuits will have the brighter bulb? Support your answer by referring to the battery. (2)

1.2. Which of these circuit's bulbs will shine the longest? Support your answer by referring to the battery. (2)

1.3. If each cell is worth 1.5 V, calculate the total voltage that the battery produces for each of the circuits. (2)


**[6]**

## Day 2


### Topic 3 Resistance

- 
- ✓ Let's learn Terminology!

**Resistance:** the degree to which a **material** can **prevent** an **electric charge** from **passing through** the material. Measured in **ohms** ( $\Omega$ ).

- 
- ✓ Let's Read!

Read through pages 134 to 137 in your textbook.

- 
- ✓ Let's sum it up!

All **conductors** have some **resistance** to the **flow** of **electrical charges** through them. All **conductors heat up** when electrical **current** passes **through** due to the **resistance**.

**Good conductors** allow **electric charges** to flow through **easily** and **do not heat up** very much when charges flow through.

A **resistor** is a conductor that **resists** the flow of **current** and is used to **control** the current or **provide useful energy transfer** (eg. Lightbulb, heater, kettle).

#### Factors that affect resistance:

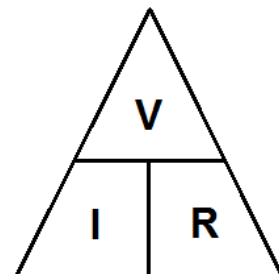
1. Type of material: different materials have different resistance to electric current.
2. Length of the conductor: **longer** wires have **more resistance** than shorter wires.
3. Thickness of the conductor: **thinner** wires have **more resistance** than thicker wires.
4. Temperature of the conductor: **hotter** conductors have **more resistance** than cold conductors.

The formula for calculating resistance is:  **$V = I \times R$**

V = Potential difference (V)

I = Current (A)

R = Resistance ( $\Omega$ )





✓ Did you understand the work?

1. Provide TWO uses for a resistor in a circuit. (2)
  2. Why is it important for resistors to be used in the circuits of sensitive technology, such as cellphones? (2)
  3. Explain how the resistor in a kettle provides useful energy transfer. (2)
- [6]**

## Day 3

### Topic 4.1 Voltage and current



✓ Let's learn Terminology!

**Current:** the **rate** at which **charge** passes through a point in a circuit.  
Measured in **ampere** (A).



✓ Let's Read!

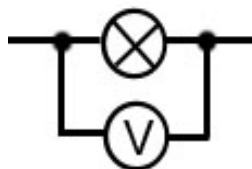
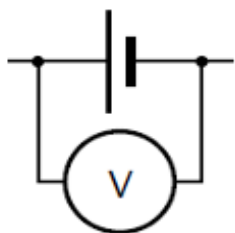
Read through pages 138 to 139 in your textbook.

✓ Let's sum it up!



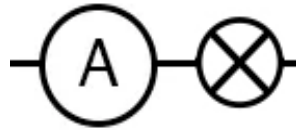
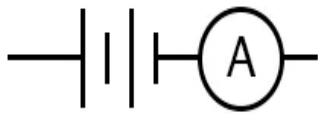
Electric charge is measured in **coulomb** (C).

When a **voltmeter** is connected across the terminals of the cell, it measures the **energy** that the cell can supply in **volts** (V). The voltmeter is always connected in **parallel** across the component it is measuring.



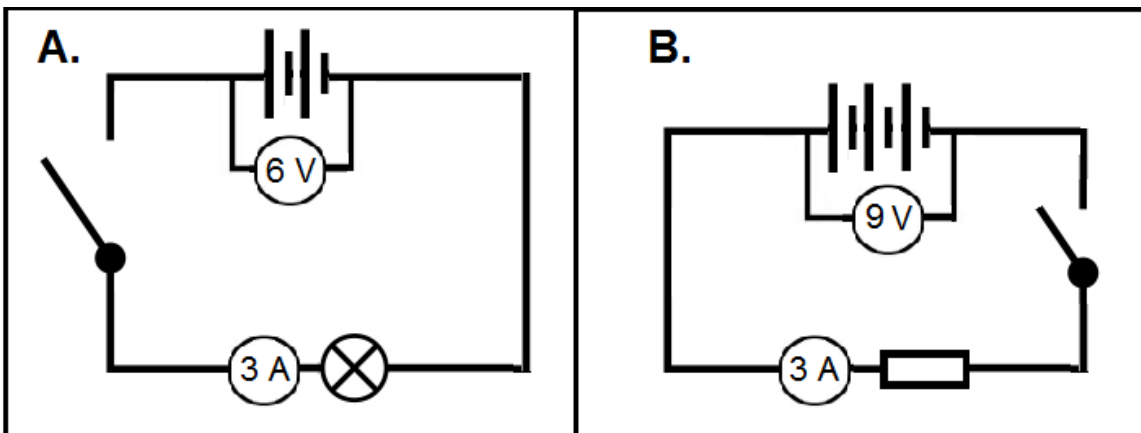
**Current** is the **rate** at which charge passes through a point in a circuit and is measured in **ampere** (A). An **ammeter** is always connected in **series** because it measures the current passing through that point in the circuit. If a circuit has **low resistance** the circuit will have a **higher current** because

there is **less resistance** to the flow of electric charges.  
 If a circuit has **high resistance** the circuit will have a **lower current** because there is **more resistance** to the flow of electric charges.



✓ Did you understand the work?

1. Calculate the resistance for the each of the two circuits below: (4)



[4]

## Day 4

### Topic 4.2 Series and Parallel circuits



✓ Let's Read!

Read through pages 139 to 143 in your textbook.



✓ Let's sum it up!

#### Series Circuits:

The **current** remains the **same** throughout the circuit. As **more resistors** are added, the **current decreases**.

The **voltage** is **split** between the resistors. The **highest resistance** has the **highest voltage**.

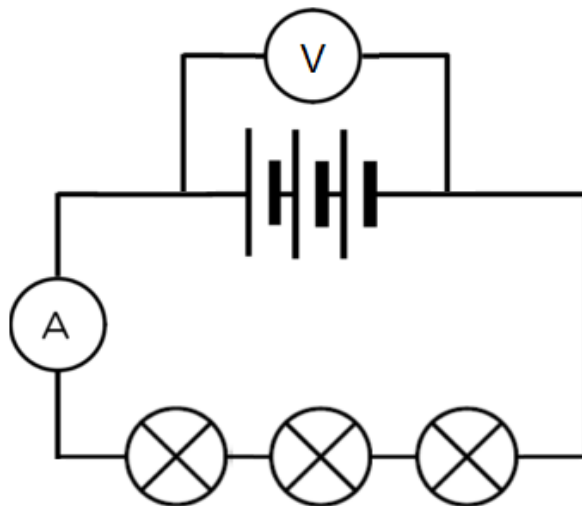
#### For Series Circuits:

**The Current** remains the **same** at any point in circuit because it only has one path to follow. It can be calculated with the formula:  $A_1 = A_2 = A_3$

**The Potential difference** is **divided** between the resistors in relation to the **resistance** of each resistor. The potential difference over **all** of the resistors is equal to the **total potential difference** over the **battery**. It can be calculated with the formula:  $V_T = V_1 + V_2 + V_3$

$V_T$  is the total voltage for the circuit, measured by the voltmeter over the battery.

$V_1$ ,  $V_2$  and  $V_3$  is the voltage through each of the individual resistors, measured by a voltmeter over each of the resistors.





## Parallel Circuits:

The **current** is **divided** in inverse proportion to the resistors, where the **highest resistance** has the **lowest current** flowing through it. The **voltage** remains the same throughout the circuit.

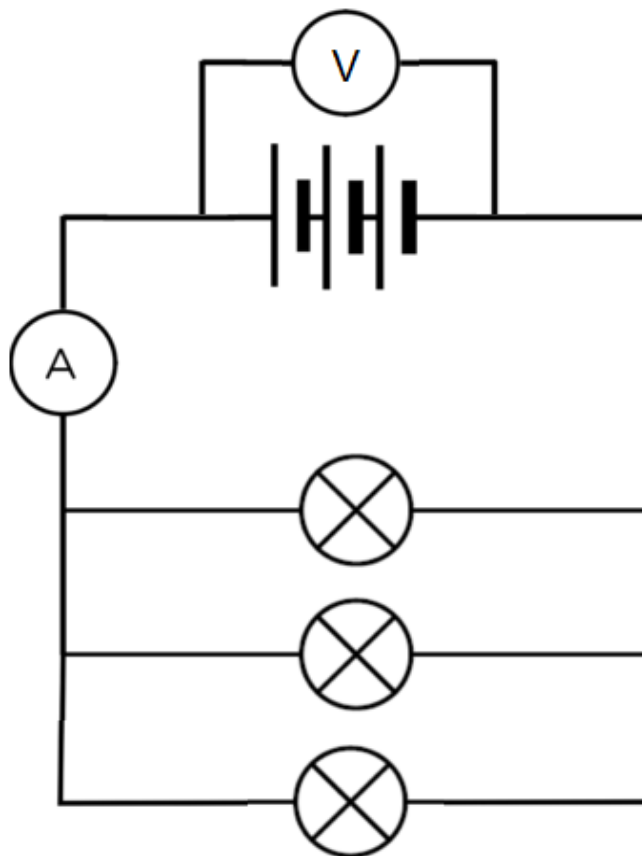
## For Parallel Circuits:

The **Current** is **split** because there are now multiple paths to take. The amount of current will be **inversly proportionate** to the resistance, so the **most current** will flow through the **weakest resistor**. It can be calculated with the formula:  $A_T = A_1 + A_2 + A_3$

The **Potential difference** remains the **same** throughout the circuit. It can be calculated with the formula:  $V_1 = V_2 = V_3$

$A_T$  is the total current for the circuit, measured before the circuit splits.

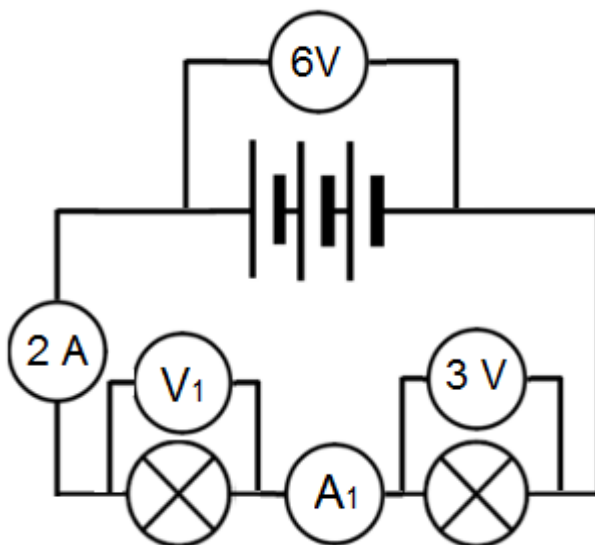
$A_1$  ,  $A_2$  and  $A_3$  are the current through the individual points in the circuit.





✓ Did you understand the work?

1. Study the circuit below and answer the questions that follow:



1.1. Using the correct formula, provide the value for ammeter 1 ( $A_1$ ). (2)


1.2. Using the correct formula, provide the value for voltmeter 1 ( $V_1$ ). (2)

1.3. Calculate the resistance of one of the lightbulbs. Both lightbulbs have the same resistance. (2)

**[6]**

## Day 5

### Revision Exercise for Week 2

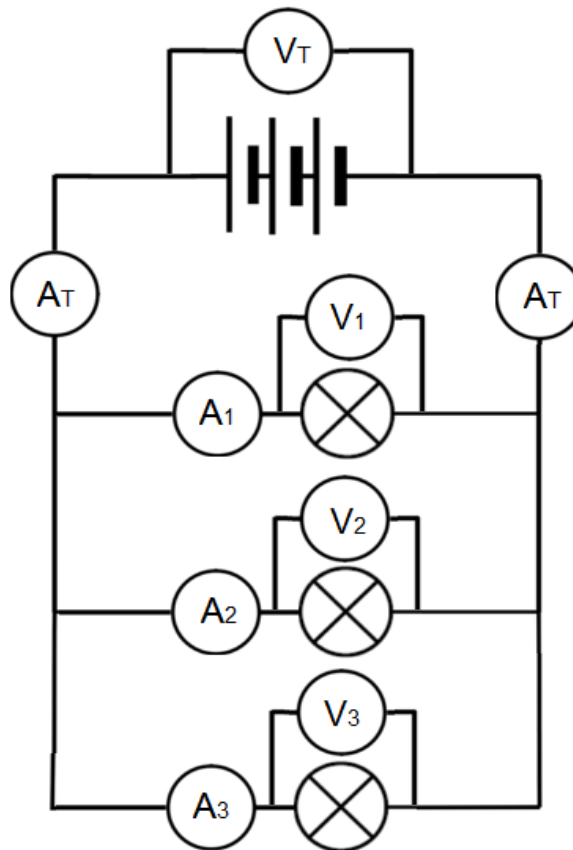
 Complete the following exercises in your workbook to revise the work covered in Week 2.

#### Question 1:

1. Study the circuit below and answer the questions that follow:

The battery produces 9V.

The three bulbs all have the same resistance of  $3\ \Omega$ .



1.1. Calculate the value for voltmeter 2 ( $V_2$ ). (2)

1.2. Calculate the value for ammeter 1 ( $A_1$ ). (2)

1.3. Calculate the value for the total current through the circuit ( $A_T$ ). (2)

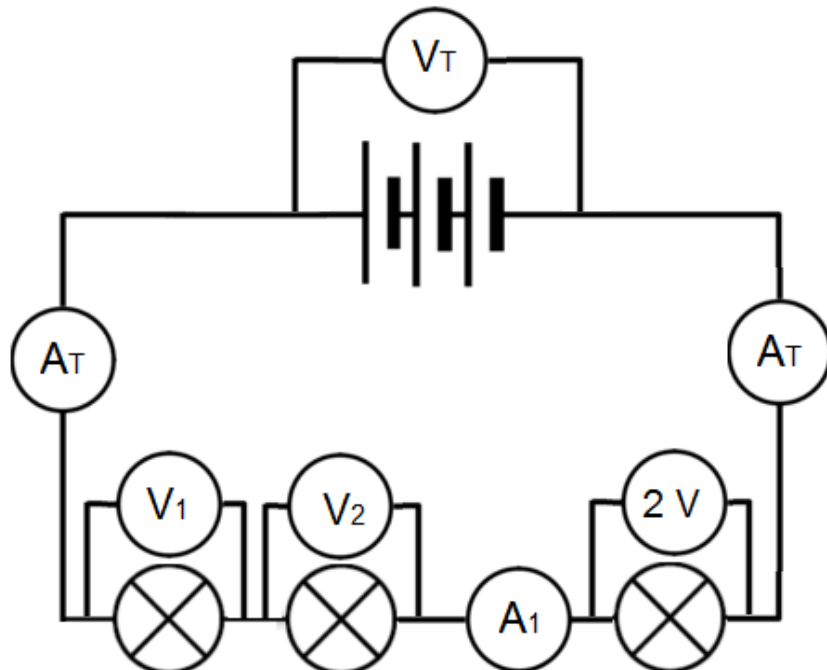
Question 2:

2. Study the diagram below and answer the questions that follow:

The battery produces 6 V.

The total current through the circuit is 2 A.

All of the bulbs have the same resistance.



2.1. Provide the value for ammeter 1 ( $A_1$ ) using the correct formula to validate your answer. (2)

2.2. Determine the value for voltmeter 1 ( $V_1$ ). (1)

2.3. Calculate the resistance of the bulbs. (2)

Question 3

3.1. Calculate the potential difference for a circuit that has a current of 3 A and a total resistance of 4  $\Omega$ . (2)

3.2. Calculate the current flowing through a circuit where the battery is producing 6 V and the total resistance is 3  $\Omega$ . (2)

**[15]**



✓ Let's mark!

$$1.1. V_1 = V_2 = V_3 \quad \checkmark$$
$$V_2 = \underline{9V} \quad \checkmark$$

$$1.2. V = I \times R$$
$$9 = I \times 3 \quad \checkmark$$
$$I = 3A$$
$$A_1 = \underline{3A} \quad \checkmark$$

$$1.3. A_T = A_1 + A_2 + A_3 \quad \checkmark$$
$$= 3 + 3 + 3$$
$$= \underline{9A} \quad \checkmark$$

$$2.1. A_1 = A_2 = A_3 \quad \checkmark$$
$$A_1 = \underline{2A} \quad \checkmark$$

2.2. All of the bulbs have the same resistance, and  $V_3$  has a potential difference of 2 V, therefore  $V_1$  will have a reading of 2V. ✓

$$2.3. V = I \times R$$
$$2 = 2 \times R \quad \checkmark$$
$$R = \underline{1\Omega} \quad \checkmark$$

$$3.1. V = I \times R$$
$$V = 3 \times 4 \quad \checkmark$$
$$R = \underline{12V} \quad \checkmark$$

$$3.2. V = I \times R$$
$$6 = I \times 3 \quad \checkmark$$
$$R = \underline{2A} \quad \checkmark$$

What was your score? 15



If you didn't achieve at least 12/15, it is in your best interest to please go through the weeks work again.

**Congratulations on completing Week 2!!!**



# Day 1

## Topic 5.1 Safety with electricity

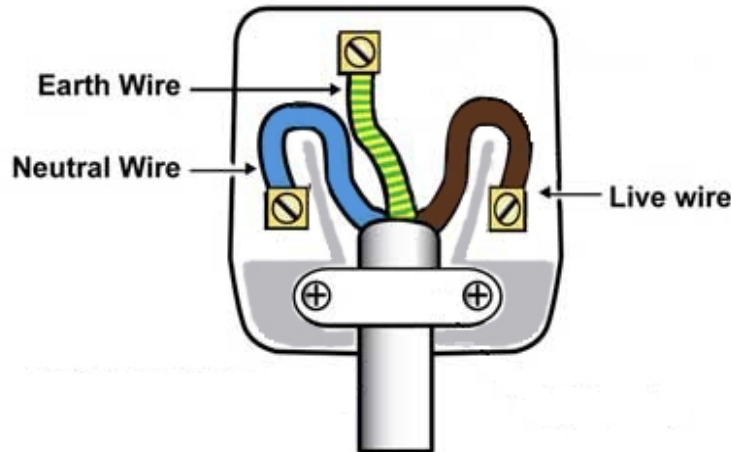


✓ Let's Read!

Read through page 144 to 146 in your textbook.



✓ Let's sum it up!



Look at the diagram above of the plug for any household appliance which has been opened to show the wires connected inside. The **brown wire** (L) is the **live wire**, which brings **electricity** to the appliance. The **blue wire** (N) is the **neutral wire** which **returns** the **current** to the **connection** which happens when the **plug** is **connected** to a **socket**.

Electrical appliances can be **dangerous** if not properly **insulated**, because the wires might touch the casing of the kettle. If a person were to touch the casing, **electricity** would **flow through** their **bodies** instead of the high-resistance material of the kettle. This is why these appliances have the **green and yellow wire** (E); the **earth wire**. This wire connects the **casing** of the **appliance** to a **metal peg** in the **ground** outside the house. If there is a **fault**, **electricity** will **flow** to the **earth** because it has **less resistance** than the human body.

For further **protection**, each house is built with a **earth leakage circuit breaker** (ELCB). This is connected to the **live wire** in the circuit and if it **detects** a **leakage** or **fault**, the **main current** is immediately **switched off**.

Light bulbs are connected in **parallel** so if one bulb blows, the rest will not lose power.

✓ Did you understand the work?



1. Explain why it is important for electric appliances to have an earth wire. (2)
2. Explain why the lights in a house are connected in parallel. (2)

[4]

## Day 2

### Topic 5.3 Safety measures in the home



✓ Let's Read!

Read through pages 146 – 147 in your textbook.



✓ Let's sum it up!

It is important for **electricity** to be treated **carefully** and with respect because it can cause **injuries** or **death** if mishandled.

In the home, it is important that you:

- **Do not** touch a switch or plug with **wet hands**. You can get **shocked**.
- **Do not overload connections** by plugging in too many appliances. This can cause the connector to **overheat** and can cause a **fire**.
- **Do not** use **electric appliances** in the bathroom where they can come into **contact** with **water**.
- **Do not** perform any repairs without first **unplugging** the **appliance** and **switching off** the **mains switch**.

#### Illegal connections:

Many poorer communities throughout the world get their **electricity** through **illegal connections** to the power grid. This is dangerous because there are **no safety features** in place. This can lead to **short circuits electrocuting** people and starting **fires**.



✓ Did you understand the work?

1. Explain why it is important to switch off the mains switch before repairing a light switch in the home. (2)
2. Why are illegal connections an issue in poor communities? (2)

## Day 3

### Topic 6.1 Electricity generation

- 
- ✓ Let's learn Terminology!


**Nuclear fission:** The **process** of **splitting** the **nucleus** of an **atom**.



**Radioactive:** a form of **energy** that is **highly dangerous**.

- ✓ Let's Read!

Read through pages 148 – 151 in your textbook.

- 
- ✓ Let's sum it up!

#### **The dynamo:**

When a **magnet** is **rotated** inside a **coil** of **wire** it **generates electricity** in the coil. This is the way we generate our electricity. All different types of electricity generation use a dynamo to generate electricity.

#### **Thermal power station:**

Uses **fossil fuels** (coal, gas, oil) that are **burned** to boil water and produce steam. The **steam** is kept under pressure to **turn turbines** which then **turn a large electromagnet** that is surrounded by **massive coils** of **wire**. The rotating electromagnet **generates electricity** in the wire.

**Burning fossil fuels** releases **gases** like **carbon dioxide** (CO<sub>2</sub>) and **sulfur dioxide** (SO<sub>2</sub>). These **greenhouse gases** prevent **heat** from **escaping** the **atmosphere** and contributes to **global warming**. **Sulfur dioxide** dissolve in **water vapour** in the atmosphere causing **acid rain**. Acid rain **negatively affects** the **environment** making **soil** and **water acidic**.

#### **Hydro-electric power station:**

**Dam walls** are built across **large rivers** or **dams** and uses the pressure of water flowing through the dam to **turn a turbine**. The turbine **turns a large electromagnet** that is surrounded by **massive coils** of **wire**. The rotating electromagnet **generates electricity** in the wire. Hydro-electric power stations **need no fuel** and **create no pollution**, but do need large amounts of water to function.



### Wind power station:

Wind-powered generators are connected to **massive rotor blades** which are **turned** by the **wind**. The **rotor blades** are **connected** to a **series of gears** which **spin** at high speeds to **generate electricity**. Wind power stations **need no fuel** and **create no pollution**, but need large areas with strong wind.

### Tidal power station:

The **ocean tides** are caused by the **gravitational pull** of the sun and moon, which can be used to **generate electricity**. A **dam wall** is built across the mouth of a river where it runs into the ocean. The dam allows **water** to **flow through** as the tide rises and falls, which **turns turbines** as it does. The turbines are linked to a generator to generate electricity.

### Solar power station:

There are various ways to use the **sun's power** to **generate electricity**. They use the sun's **heat** to **boil water** and create **steam**, which then **turn turbines** to **generate electricity**. Solar geysers use the sun's rays to **heat the water** for household use.

### Nuclear power station:

In a nuclear reactor **nuclear fission** takes place, where **uranium** atoms are split in half which **generates large amounts** of **heat**. The heat is used to generate **steam** which turns **turbines** to produce **electricity**.

The type of uranium used is **radioactive**, meaning that it emits **harmful radiation** which can cause **death** and **cancer**. The **waste material** produced is **highly radioactive** and must be **stored safely** because it can remain radioactive for hundreds of years.



✓ Did you understand the work?

1. Why is it important for the world to find renewable sources of electricity? (2)
2. List two waste products formed by thermal power stations (2)
3. Explain the dangers of the waste produced by nuclear power stations. (2)

**[6]**

## Day 4

### Topic 6.4 National electricity grid



- ✓ Let's learn Terminology!

**Transformer:** A device that steps the voltage up to a higher value or steps the voltage down to a lower value.

**Grid overload:** The demand for electricity is more than the available supply.



- ✓ Let's Read!

Read through pages 151 – 153 in your textbook.



- ✓ Let's sum it up!

Most of South Africa's electricity is produced in coal-burning power stations which results in serious **air pollution**. The electricity that is generated has to be transported to the rest of the country along thousands of kilometers of power lines.

The problem with the long power lines is that the **resistance** of the **wires** results in a **waste** of **electricity**. To reduce this, the **electricity is boosted** by a **transformer** when it leaves the power station. When the electricity reaches its destination, a **substation lowers** the **voltage** for household usage.

All of the power stations, transformers, substations and power lines form the National Grid.

#### **Grid overload:**

If the demand for electricity is more than Eskom can provide, they will implement "**load shedding**": a system where **power** to certain areas is **cut**. This is done to prevent a **grid overload**.

A **power surge** is the sudden **increase** in **voltage** supply. This can be caused by **lightning** or **redirecting power**, and power surges can damage sensitive electronics such as computers or cellphones. **Surge protectors** can be installed in a household to protect the electronics from power surges.



✓ Did you understand the work?

1. Explain why electricity transported by power lines needs to be at a very high voltage. (2)
2. Explain what is meant by load shedding. (2)

## Day 5



To revise the work for Term 3 work through the exercises below.

### Question 1

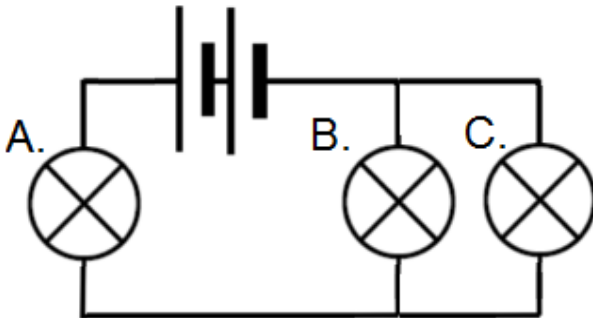
- 1.1. Explain the difference between a contact force and a field force. (2)
- 1.2. State THREE ways that a force can change on object. (3)
- [5]**

### Question 2

- 2.1. Explain why your weight will be different on Earth and on the moon. (2)
- 2.2. The mass of an object is 80kg. Calculate it's weight on Earth. (2)
- 2.3. An object weighs 24N on the moon which has a gravitational force of  $1.6\text{m.s}^2$ . Calculate the mass of the object. (2)
- [6]**

### Question 3

- 3.1. List the FOUR factors that affect the resistance of a conductor. (4)
- 3.2. Study the circuit below where the bulbs have identical resistance:



- Which bulb burns the brightest? Motivate your answer. (2)
- [6]**

### Question 4

- 4.1. Explain the benefit of wiring all of the lights in a house in parallel. (1)
- 4.2. Explain why it is dangerous to overload connections in your house. (2)
- [3]**

**Total: [20]**