THE NEW LOWER SECONDARY SCHOOL CURRICULUM

S.4 PHYSICS LEARNER'S WORK BOOK

BY

PHYSICS DEPARTMENT

NDEJJE S.S.S

First edition

4. A charge of 20 kC crosses two sections of a conductor in 1minute. Find the current through the conductor.

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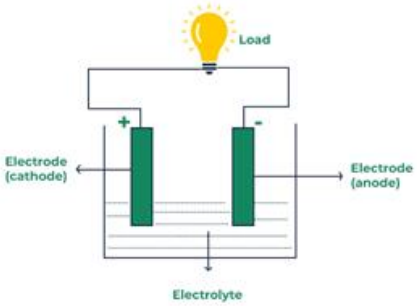
ELECTRIC CELLS



Assignment

(a) Which device that is used to convert chemical energy into electrical energy.

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(b) What do understand by;

(i) An electrolyte

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(ii) electrodes

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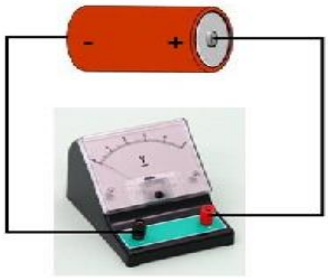
Measuring electromotive force.

Activity

You have been provided with a dry cell, connecting wires and a voltmeter. Carryout an investigation to measure the electromotive force of a cell from the voltmeter.



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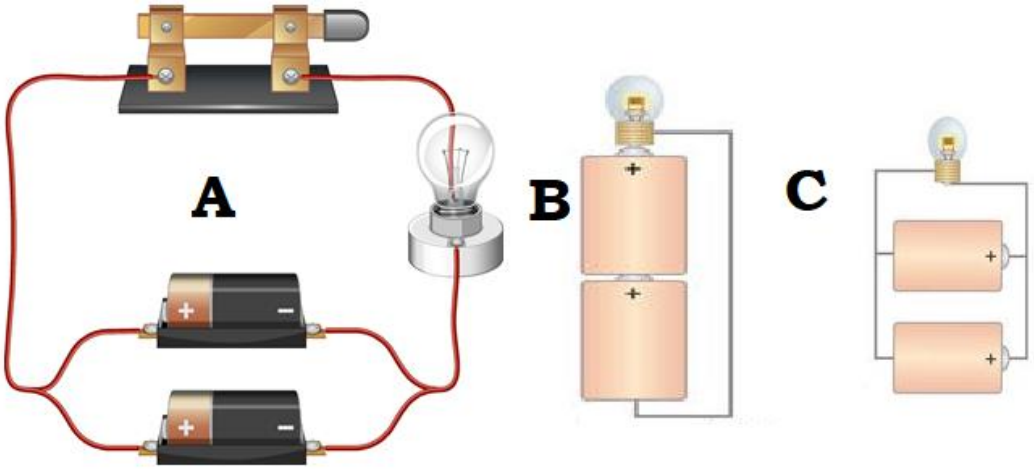
Arrangement of cells

In groups discuss and identify the following arrangements



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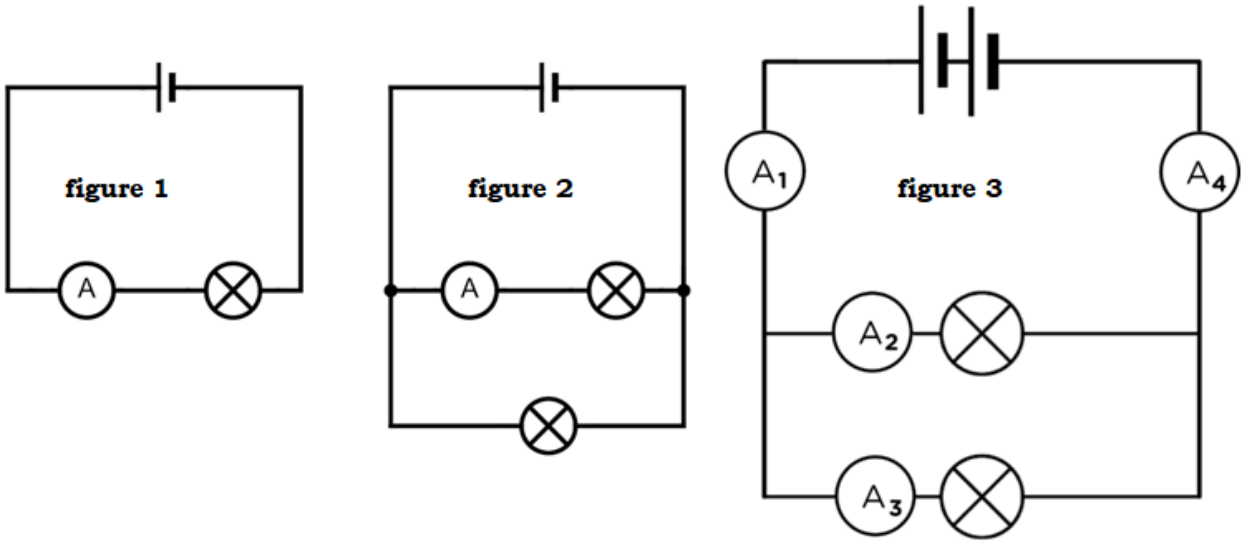
Activity 6

In your group, carryout an investigation using cells, a bulb, and ammeter to measure current flowing through different parts of series and parallel circuits, and then explain why domestic circuits are in parallel. Record the ammeter reading in each case and comment on the results.



TOPIC 2: VOLTAGE, RESISTANCE AND OHM, S LAW

Learning outcomes

The learner should be able to:

a) Understand electrical resistance, how it is measured its relationship to current and voltage and the factors that affect it.

b) Know the function and the use of a diode, transistor, thermistor, LDR. , LED and potentiometer

Electrical resistance

Self-check

When electrical current is passed through a bulb and a flat iron, flat iron becomes hotter than the bulb. Find out why?

Activity 1

When a bulb is connected to dry cells, it is brighter when the circuit is complete than when a resistor is included in the same circuit. In your group, research and discuss;

(i) Meaning of electrical resistance ,

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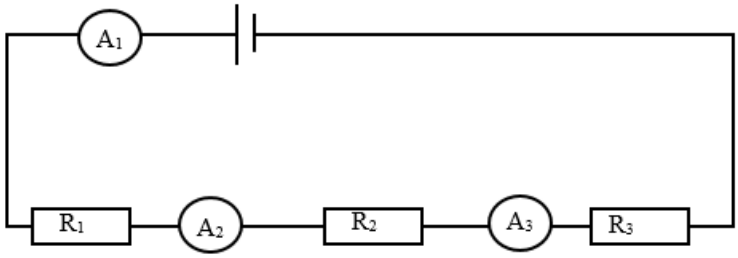
Arrangement of resistors in circuits

Activity

You have been provided with different resistors, ammeter, connecting wires and a dry cell. Arrange the apparatus with the ammeter in position A_1 and note its reading.



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Repeat the above steps with the ammeter in position A_2 and A_3

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Comment on the ammeter readings in three different positions.

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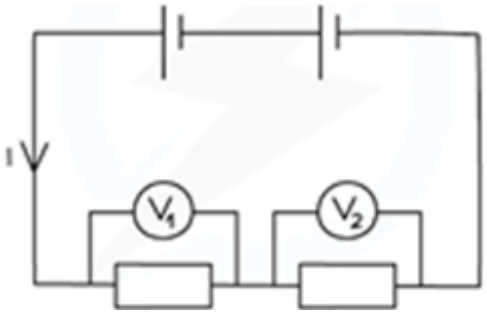
You have been provided with different resistors, a voltmeter, connecting wires and dry cells. Arrange the apparatus with the voltmeter in position V_1 and note its reading.



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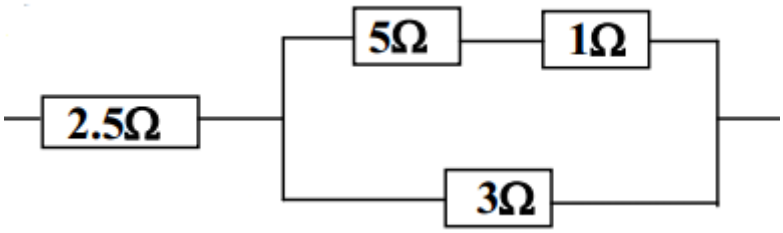

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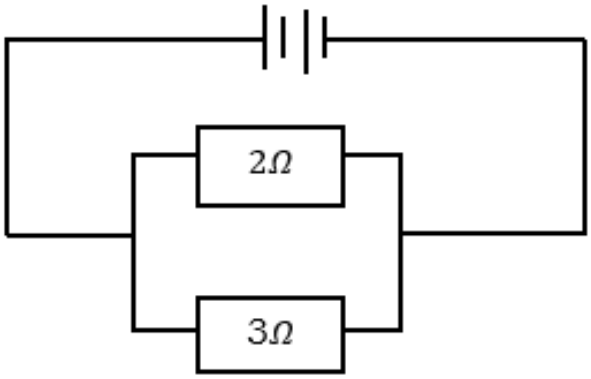
CALCULATIONS INVOLVING VOLTAGE/ OHM'S LAW:

1. Two cells each of e.m.f 1.5V and negligible internal resistance are connected across resistors of 2 ohms and 3 ohms



Calculate:

a) the total current in the circuit

b) the current that passes through

(i) the 2Ω resistor

(ii) the 3Ω resistor

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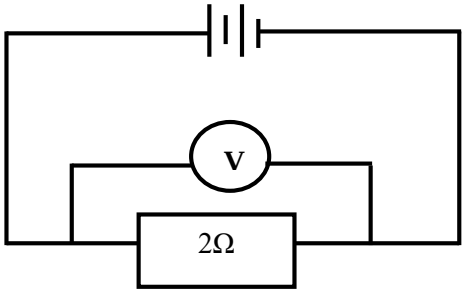
6. Two cells each of e.m.f 1.5 V and internal resistance 0.5 Ω are connected in series with a resistor of 2 Ω as in the figure below.



What is the reading of the voltmeter V.

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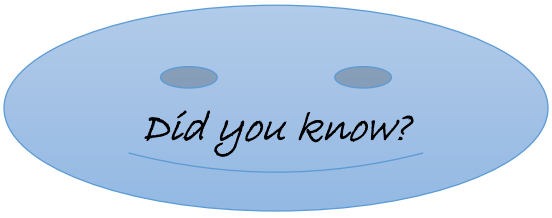


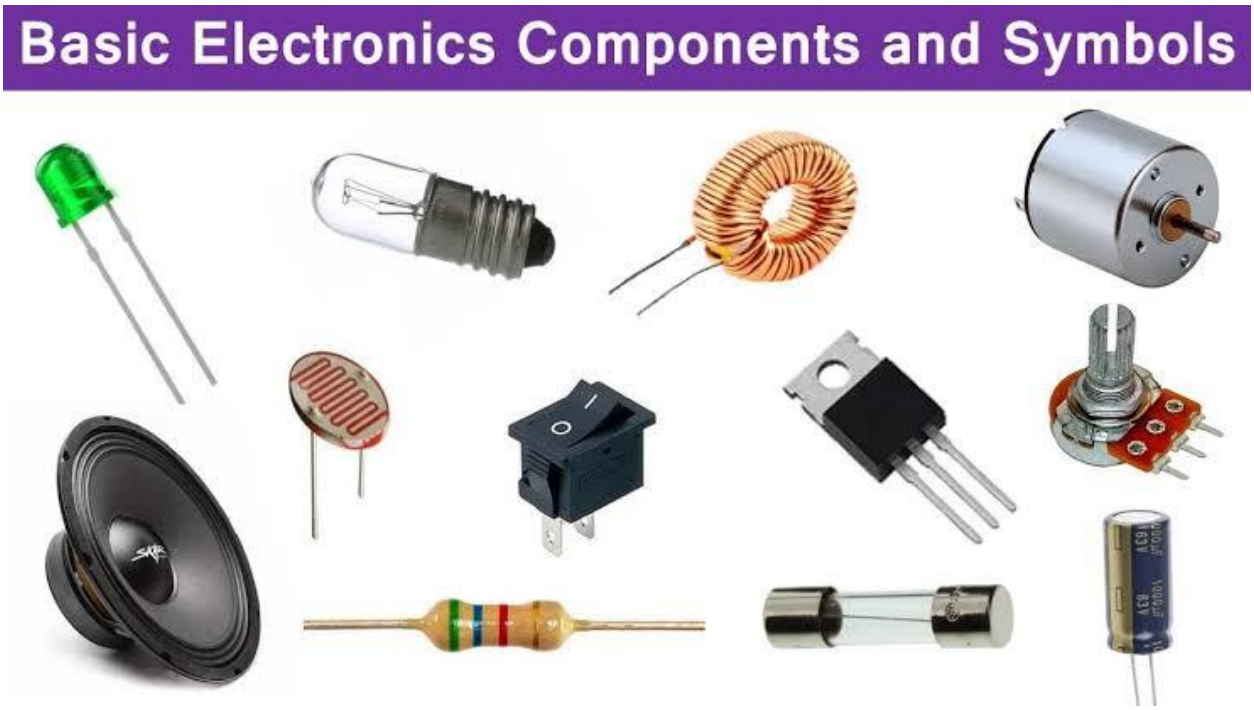
Electric power $P = \frac{VIt}{t} = IV = I^2R = \frac{V^2}{R}$

SAMPLE ACTIVITY OF INTEGRATION

Your friend who has never studied physics and is beginner as a technician wants to initiate electronics and repair centre which deals with several devices including spare parts.

He wants to purchase and stock the most important spare parts first. He has approached you as a student who has studied electricity and you have better information about the electronic devices to help him purchase these components.

Support



Task.

Prepare a document to address your friend's challenge.

TOPIC 3: ELECTROMAGNETIC EFFECTS

Competency: The learner should know and understand how magnetic fields interact with electric fields and the applications of the phenomenon.

Assignment

Magnets are very important in everyday life and therefore it important to know them in addition to what we learnt in book 2. In this case therefore it is important to review and know the terms applied in this chapter. In pairs research and discuss some of the terms applied;

(i) Magnetic field

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(ii) Magnetic field lines

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(iii) Magnetic flux

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(iv) Neutral point

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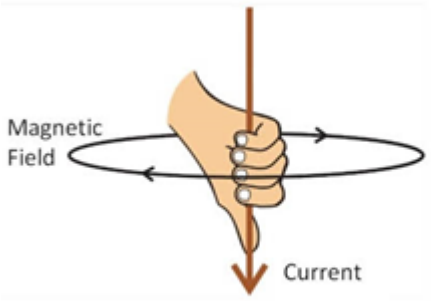
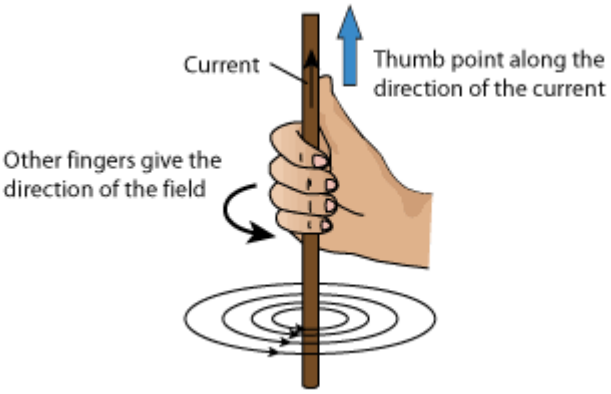
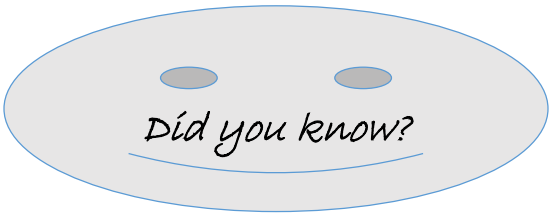
Magnetic Field of a current carrying conductor/wire.

Direction of the magnetic field due to a current carrying conductor





It is scientifically proved that when current flows in a wire, a magnetic field is generated around that wire.



Did you know that right hand grip rule can also be used to determine the direction of magnetic field of a current carrying conductor?

Assignment

Prepare a presentation to the rest of the class on how to determine the direction of the magnetic field on such a conductor and draw clear diagrams for illustration for current directed into the paper or out of the paper.

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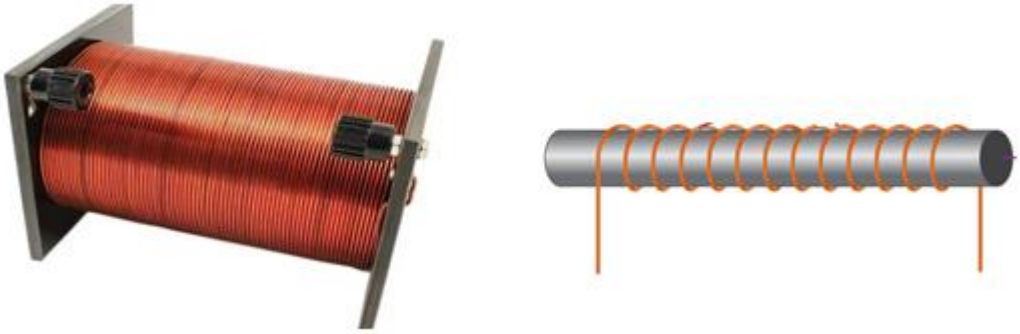
Magnetic field due to current flowing in a solenoid



A solenoid is one of the important devices for which wires coiled on hollow metallic cylinder carry current and a magnetic field is setup.

Activity 3

In pairs, research, discuss and prepare a presentation on magnetic field lines outside and inside the solenoid using a diagram.

(b) telephone receiver,

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Some of domestic appliances

Kettle

Light bulb

Microwave

Electric drill

Clothes iron

Electric fan

Air conditioner

Coffee maker

Activity 2

In our homes we normally use several appliances which serve a number of applications including cooking, boiling water, ironing, etc. In pairs;

Identify domestic appliances that convert electrical energy into;

(i) Heat energy

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(ii) Heat and light energy

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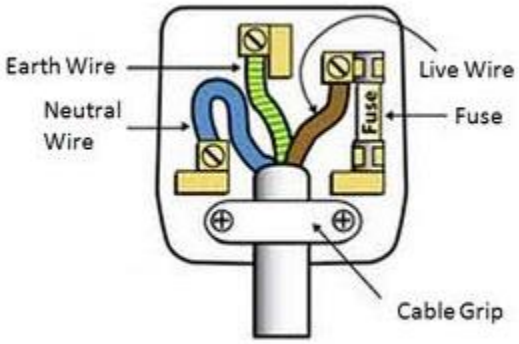

Electrical appliances are safe when safety devices are installed even when there is excessive current. In pairs, research, discuss and prepare a presentation on three-pin plug. Dismantle it to see its inside, identify the fuse and three wires i.e earth wire, live wire and neutral. Re assemble it and test whether it is still working. Prepare a presentation to the rest of the class.

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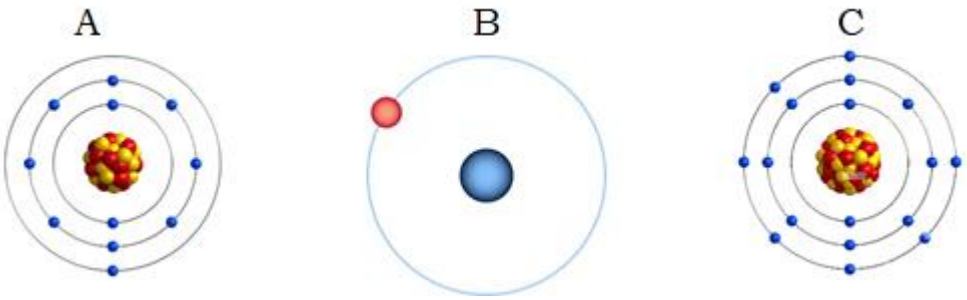
In pairs discuss the importance of the earth wire

Did you know that that for a neutral atom the number of protons is equal to the number of electrons?



Assuming the atoms above are neutral. What is their number of electrons and protons?

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Representing different atoms

Each atom of a given element has got unique symbol that represents it. If the symbol of the atom is X, then the atom is represented as ${}^{\mathrm{A}}_{\mathrm{Z}}\mathrm{X}$ where A is the atomic mass and Z is atomic number.

In pairs, state the number of protons and neutrons in the following elements

(i) ${}^{238}_{92}U$……

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(ii) ${}^{37}_{17}Cl$……

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(iii)

${}^{4}_{2}He$……

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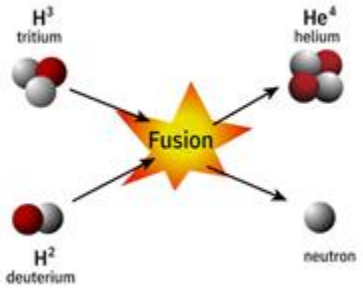
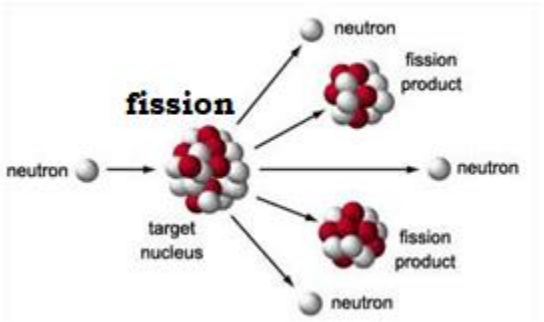
Isotopes

Competency: The learner should understand how nuclear processes occur, their uses, and the dangers associated with them.

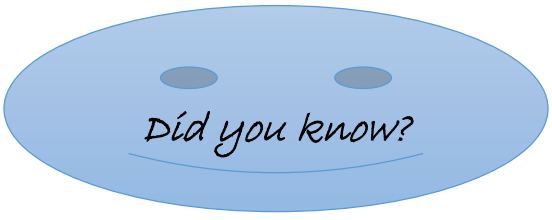
Learning outcomes

a) Understand the processes of nuclear fission and fusion and the associated energy changes
b) Understand the spontaneous and random nature of nuclear decay and interpret decay data in terms of half-life
c) Know the applications of radioactivity and the dangers associated with exposure to radioactive materials
d) Understand and appreciate that there are significant social, political, and environmental dimensions associated with use of nuclear power



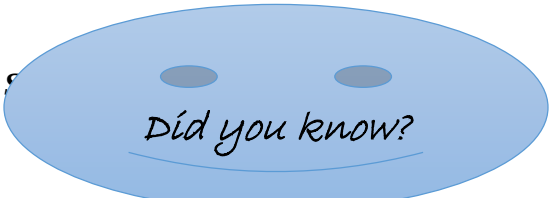


Previously chapter 5, we discussed that all matter is made up of tiny particles. It is believed that different objects are made up of different combinations of the atoms.



The change in sub-atomic particles e.g protons can cause changes which can affect man kind?

Radioactivity



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(iii) How half -life is determined using decay curve

Numerical items

Activity

1. The following figures were obtained from the reading of a counter source. Plot a graph of the count rate against time and deduce the half-life of the source.

Time(s)	0	20	40	60	80	100	120
Count rate	120	74	48	30	20	12	8

2. The table shows remaining nuclei of a certain radioactive substance with in the given time.

Time(h)	0	10	20	30	40	50	60	70
Number of nuclei present	800	560	400	280	200	160	100	40

Plot a decay curve and use it to estimate the half-life

3. The following values obtained from the readings of a rate meter from a radioactive isotope of iodine

Time (min)	0	5	10	15	20
Countrate (min $^{-1}$)	295	158	86	47	25

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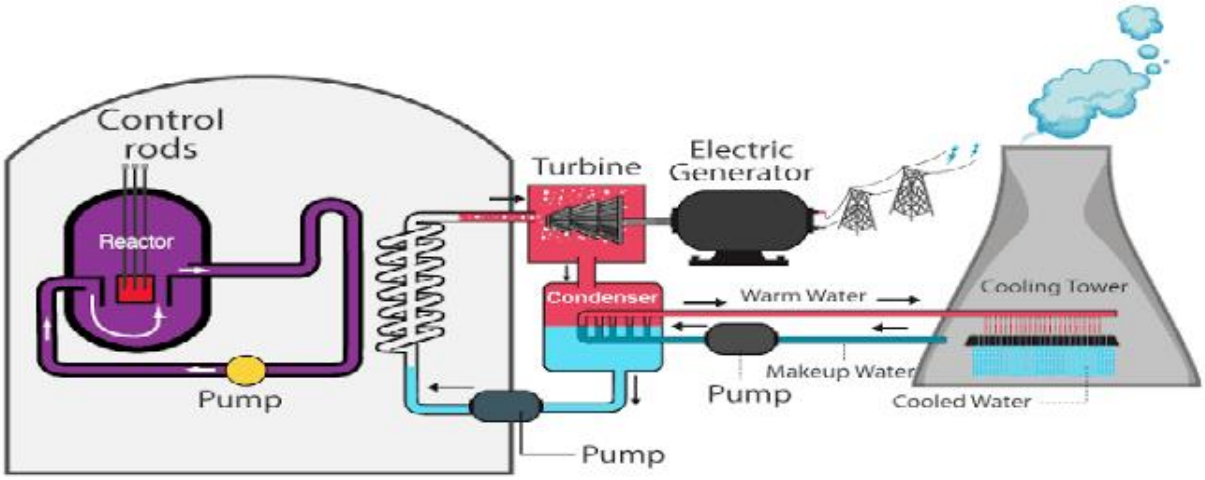
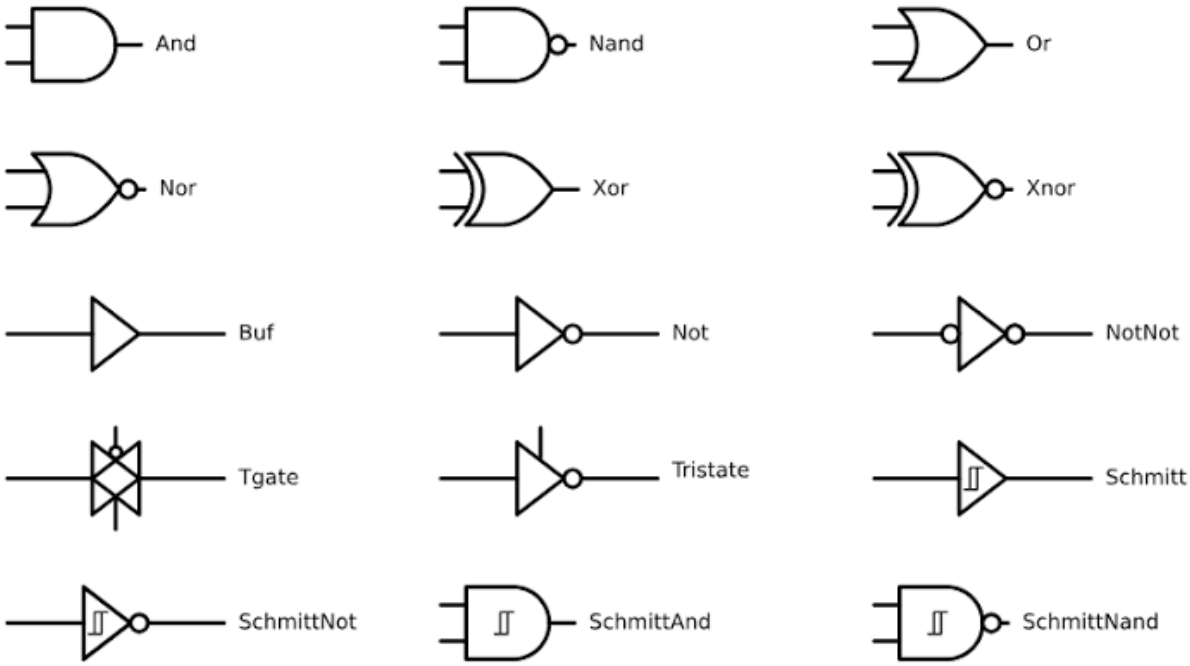
Nuclear reactors





Previously in chapter 2, you discussed resistors. Resistors and other electronic components like diodes are used to make digital devices or system e.g radios, television sets, phones, computers, etc.

Potential dividers