

SCIENCE COURSE

Physical & Life Sciences Pack

Lectures with diagrams, data and quizzes

Presenter Name · 7 · 2026



Course map

- 01 Acids, Bases and Salts
- 02 Magnetism
- 03 Cell: The Unit of Life
- 04 Newton's Laws of Motion
- 05 Electricity and Circuits
- 06 Acids, Bases and Salts



Image

01

ACIDS, BASES AND SALTS



The chemistry of everyday substances

Lecture 1 · Acids, Bases and Salts

What is acids and bases?

Acids release hydrogen ions in water, bases release hydroxide ions, and the two react to form salts and water.

We meet them every day — lemon juice, soap, baking soda and table salt are all part of this family.



Diagram

Key concepts

01

Acids

Sour, turn blue litmus red,
pH below 7.

02

Bases

Bitter, soapy, turn red litmus
blue, pH above 7.

03

Salts

Formed when acids and
bases neutralise.

Neutralisation

1 Acid

e.g. hydrochloric acid

2 Base

e.g. sodium hydroxide

3 React

Ions combine

4 Products

Salt and water

pH of common substances

Substance	pH	Nature
Lemon juice	2	Acidic
Milk	6.5	Slightly acidic
Pure water	7	Neutral
Baking soda	9	Basic
Soap solution	10	Basic

Reference values for illustration.

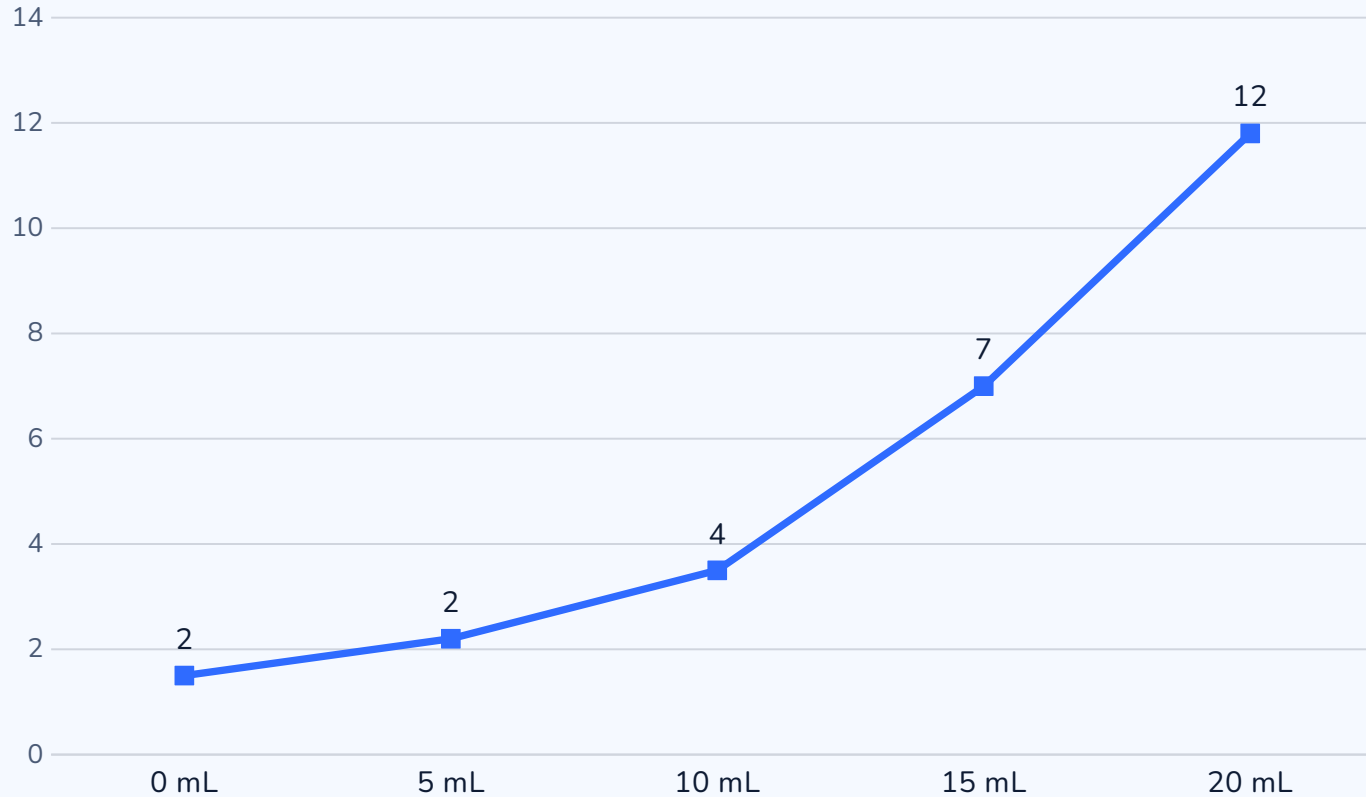
Experiment

- Prepare a natural indicator from red cabbage
- Add it to small samples of household liquids
- Note the colour change for each
- Arrange the samples from acidic to basic

SAFETY

Wear gloves and goggles; never taste chemicals.

pH during neutralisation



The pH jumps sharply near the neutral point (sample data).

Sample data for illustration — replace with your own figures.

Real-world applications



Image 1

Medicine

Antacids neutralise stomach acid



Image 2

Farming

Lime corrects acidic soil



Image 3

Cleaning

Soaps and detergents are basic

Quick facts

0–14

the pH scale

7

neutral pH of pure water

2

approximate pH of
stomach acid

Summary

- Acids have pH below 7, bases above 7
- Indicators show acidic or basic nature
- Neutralisation forms salt and water
- They are used in medicine, farming and cleaning



Image

02

MAGNETISM



Poles, fields and everyday uses

Lecture 2 · Magnetism

What is magnets?



Diagram

Magnetism is the force by which magnets attract iron and attract or repel other magnets.

Every magnet has a north and a south pole. Like poles repel and unlike poles attract. The space around a magnet where its force acts is its magnetic field.

Key concepts

01

Poles

North and south ends of a magnet.

02

Magnetic field

Region where the force acts.

03

Electromagnet

A coil that becomes a magnet with current.

Making an electromagnet

1 Coil

Wrap wire round a nail

2 Connect

Attach to a cell

3 Test

Pick up pins

4 Switch off

Pins drop

Magnetic or not?

Object	Material	Attracted?
Paper clip	Steel	Yes
Coin (most)	Alloy	Varies
Pencil	Wood	No

Reference values for illustration.

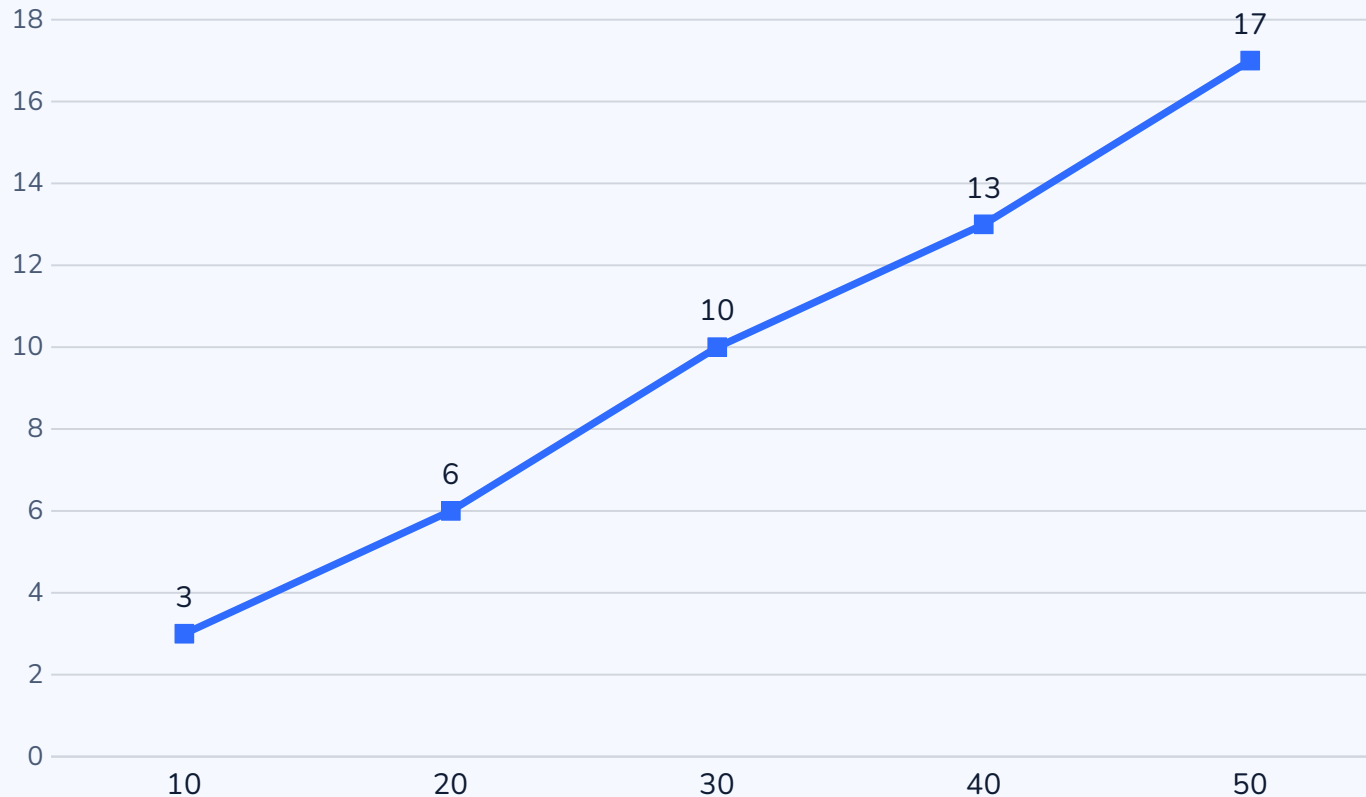
Experiment

- Sprinkle iron filings on paper over a magnet
- Tap the paper gently
- Observe the field pattern
- Draw the field lines

SAFETY

Keep magnets away from phones and cards.

Pins lifted vs number of coils



Electromagnet strength (sample data).

Sample data for illustration — replace with your own figures.

Real-world applications



Image 1

Compass

Navigation



Image 2

Motors

Fans and vehicles



Image 3

Medical

MRI scanners

Quick facts

2

poles in every magnet

Earth

behaves like a giant
magnet

Maglev

trains float on magnets

Summary

- Magnets have two poles
- Like poles repel, unlike attract
- Fields can be seen with iron filings
- Current can create magnetism



Image

03

CELL: THE UNIT OF LIFE



Structure and function of plant and animal cells

Lecture 3 · Cell: The Unit of Life

What is cells?

A cell is the smallest structural and functional unit of life; every living thing is made of one or more cells.

Plant and animal cells share a nucleus, cytoplasm and cell membrane. Plant cells also have a cell wall, chloroplasts and a large vacuole.



Diagram

Key concepts

01

Nucleus

Control centre with genetic material.

02

Mitochondria

Powerhouse that releases energy.

03

Cell membrane

Controls what enters and leaves.

Viewing cells

1 Peel

Onion skin layer

2 Stain

A drop of iodine

3 Mount

Cover slip on slide

4 Observe

Under the microscope

Plant vs animal cell

Part	Plant cell	Animal cell
Cell wall	Present	Absent
Chloroplast	Present	Absent
Vacuole	Large	Small or none

Reference values for illustration.

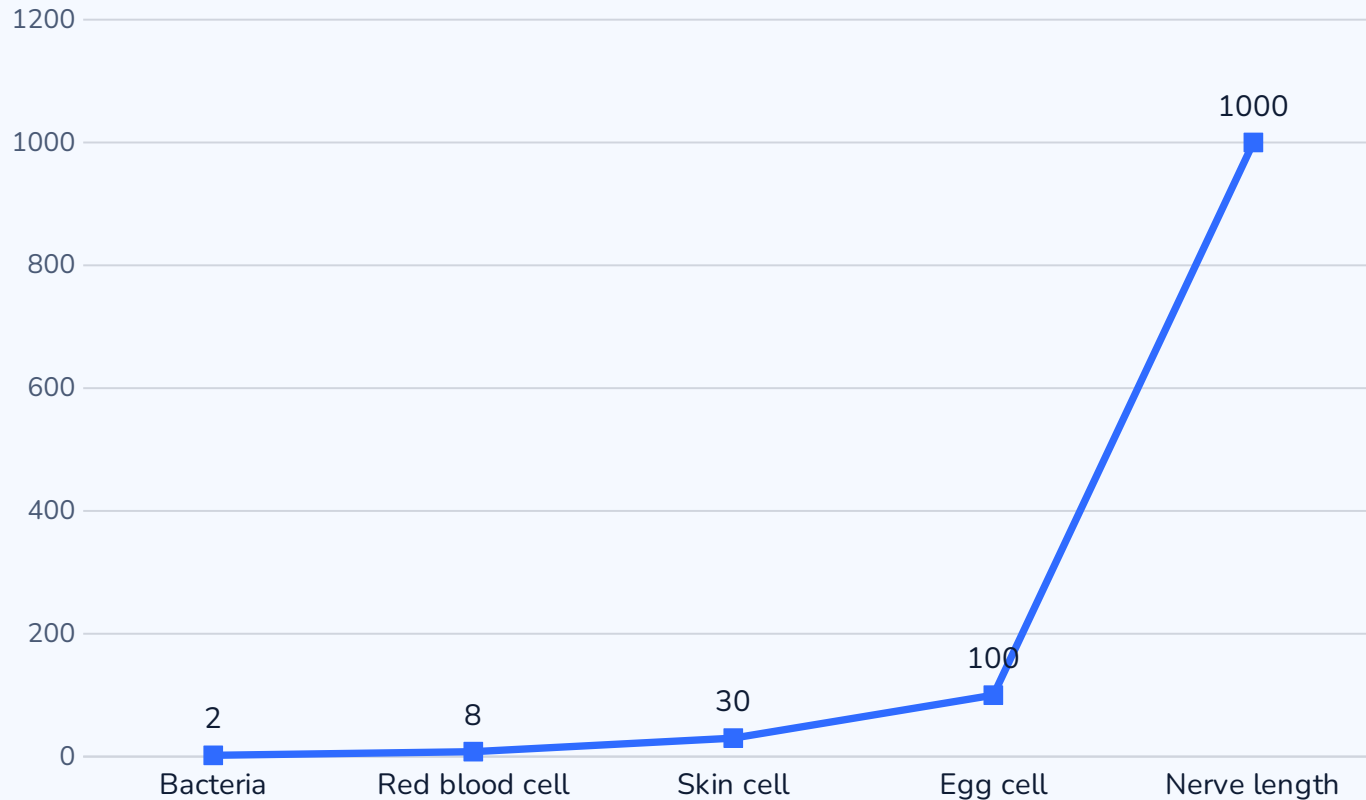
Experiment

- Peel a thin layer of onion skin
- Place it on a slide with water
- Add a drop of iodine stain
- Observe and draw the cells

SAFETY

Handle slides and blades carefully.

Approximate cell sizes



Illustrative sizes (sample data).

Sample data for illustration — replace with your own figures.

Real-world applications



Image 1

Medicine

Understanding diseases



Image 2

Biotechnology

Growing tissues



Image 3

Agriculture

Better crop varieties

Quick facts

1665

cells first observed

37 trillion

cells in a human body
(approx.)

1

cell in bacteria

Summary

- All living things are made of cells
- The nucleus controls the cell
- Plant cells have walls and chloroplasts
- Cells come from existing cells



Image

04

NEWTON'S LAWS OF MOTION



Force, mass and motion explained

Lecture 4 · Newton's Laws of Motion

What is Newton's laws?



Diagram

Newton's three laws describe how objects move when forces act on them.

They explain everything from a rolling ball to rockets and planets, and they form the foundation of classical mechanics.

Key concepts

01

First law

Objects keep their state of motion unless a force acts.

02

Second law

Force equals mass times acceleration ($F = ma$).

03

Third law

Every action has an equal and opposite reaction.

Solving a force problem

1 Draw

Free-body diagram

2 Resolve

Split forces into components

3 Apply

Use $F = ma$ on each axis

4 Solve

Find acceleration or force

Everyday examples

Situation	Law	Why
Seatbelts	First	Body keeps moving when the car stops
Pushing a trolley	Second	More force, more acceleration
Rocket launch	Third	Gas pushed down, rocket pushed up

Reference values for illustration.

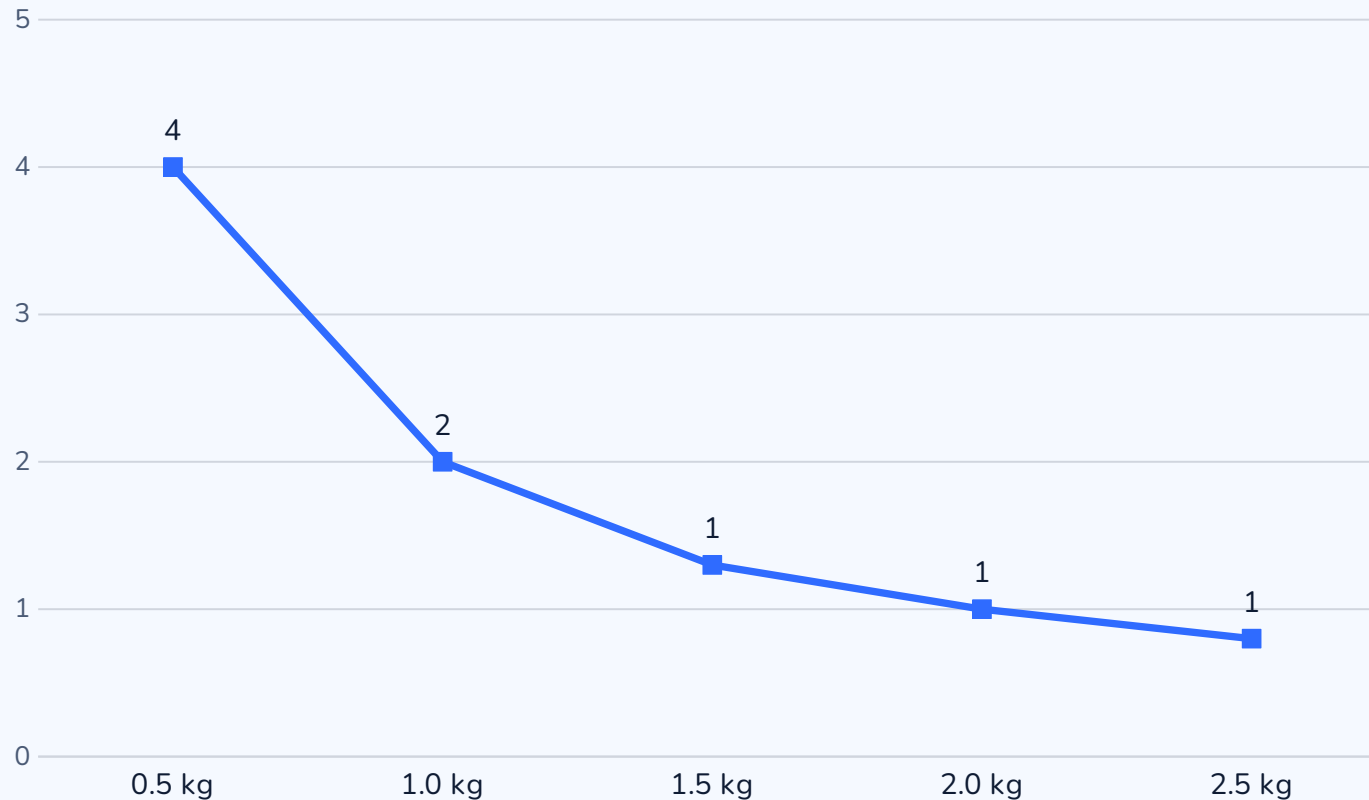
Experiment

- Roll a trolley down a ramp with a fixed force
- Add masses to the trolley step by step
- Time the trolley over a fixed distance
- Calculate acceleration for each mass

SAFETY

Keep the ramp stable and stand clear of moving trolleys.

Acceleration vs mass



With the same force, acceleration falls as mass rises (sample data).

Sample data for illustration — replace with your own figures.

Real-world applications



Image 1

Vehicles

Brakes, airbags and seatbelts



Image 2

Sports

Kicking, throwing and running



Image 3

Space

Rockets and satellites

Quick facts

$$F = ma$$

second law in one line

1 N

force to accelerate 1 kg at
1 m/s²

1687

year the laws were
published

Summary

- Objects resist changes in motion
- Force causes acceleration ($F = ma$)
- Forces come in action–reaction pairs
- The laws explain motion all around us



Image

05

ELECTRICITY AND CIRCUITS



Current, voltage and resistance made simple

Lecture 5 · Electricity and Circuits

What is electric circuits?

Electricity is the flow of electric charge through a conductor, usually as moving electrons in a wire.

A circuit is a closed path for current. Voltage pushes charge, resistance opposes it, and Ohm's law links them: $V = I \times R$.



Diagram

Key concepts

01

Current (I)

Flow of charge, measured in amperes.

02

Voltage (V)

Electric push, measured in volts.

03

Resistance (R)

Opposition to current, in ohms.

Building a simple circuit

1

Cell

Source of voltage

2

Wire

Path for current

3

Switch

Opens or closes the path

4

Bulb

Glows when current flows

Series vs parallel

Feature	Series	Parallel
Current	Same everywhere	Splits in branches
If one bulb fails	All go off	Others stay on
Used in	Decorative lights	House wiring

Reference values for illustration.

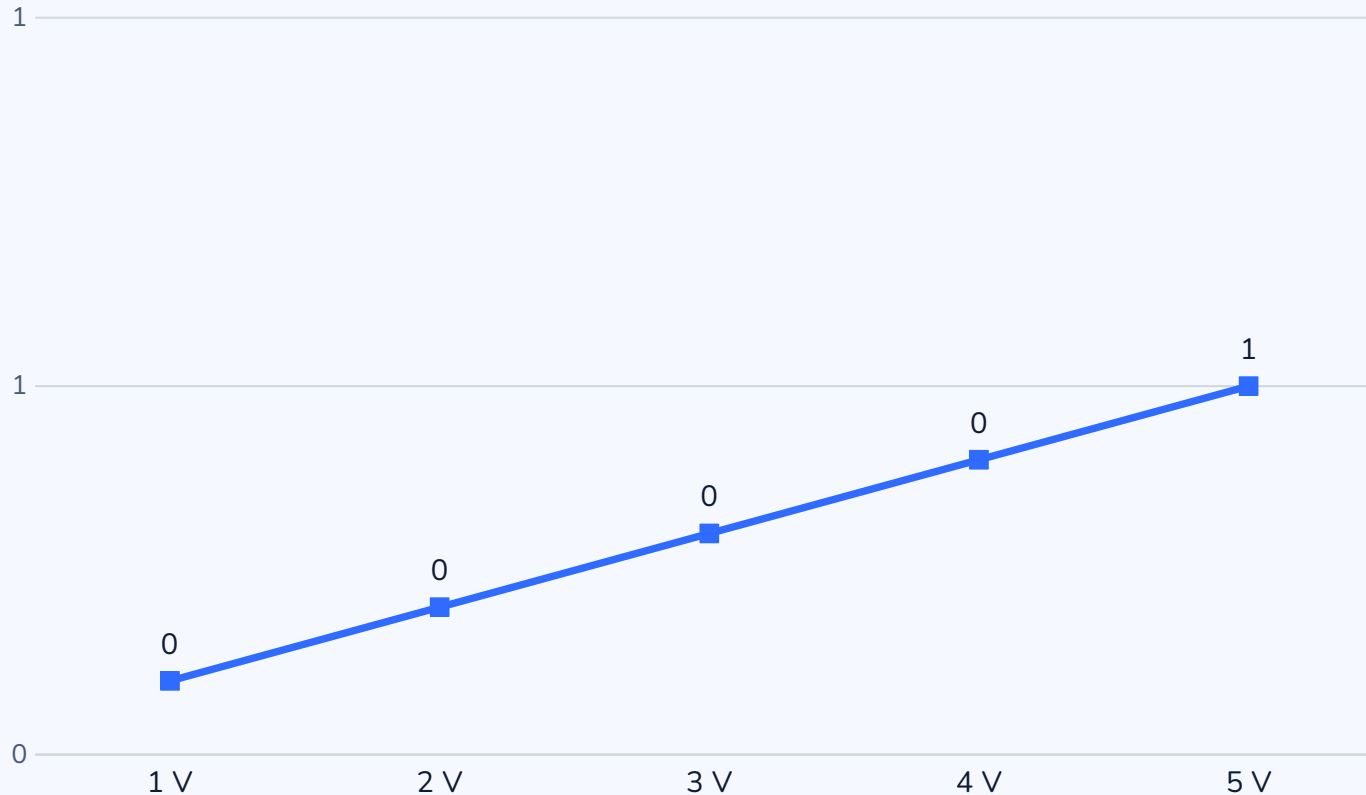
Experiment

- Connect a cell, switch and bulb with wires
- Close the switch and observe
- Add a second bulb in series, then in parallel
- Compare brightness

SAFETY

Use low-voltage cells only; never touch mains wiring.

Current vs voltage (Ohm's law)



For a $10\ \Omega$ resistor (sample data).

Sample data for illustration — replace with your own figures.

Real-world applications



Image 1

Homes

Lighting and appliances



Image 2

Electronics

Phones and computers



Image 3

Transport

Electric vehicles

Quick facts

$$V = IR$$

Ohm's law

1 A

= 1 coulomb per second

230 V

household supply in India

Summary

- Current needs a closed path
- Voltage drives current
- Resistance limits current
- Series and parallel behave differently



Image

06

ACIDS, BASES AND SALTS



Indicators, pH and everyday chemistry

Lecture 6 · Acids, Bases and Salts

What is acids and bases?



Diagram

Acids taste sour and turn blue litmus red; bases taste bitter, feel soapy and turn red litmus blue.

When an acid reacts with a base, they neutralise each other to form salt and water. The pH scale from 0 to 14 measures how acidic or basic a solution is.

Key concepts

01

Indicator

Changes colour with acids or bases.

02

pH

Scale of acidity from 0 to 14.

03

Neutralisation

Acid + base $\rightarrow$ salt + water.

Neutralisation

1 Take

Dilute acid in a beaker

2 Add

Indicator drops

3 Titrate

Add base slowly

4 Observe

Colour change at neutral

Common substances

Substance	Type	pH (approx.)
Lemon juice	Acid	2
Pure water	Neutral	7
Soap solution	Base	10

Reference values for illustration.

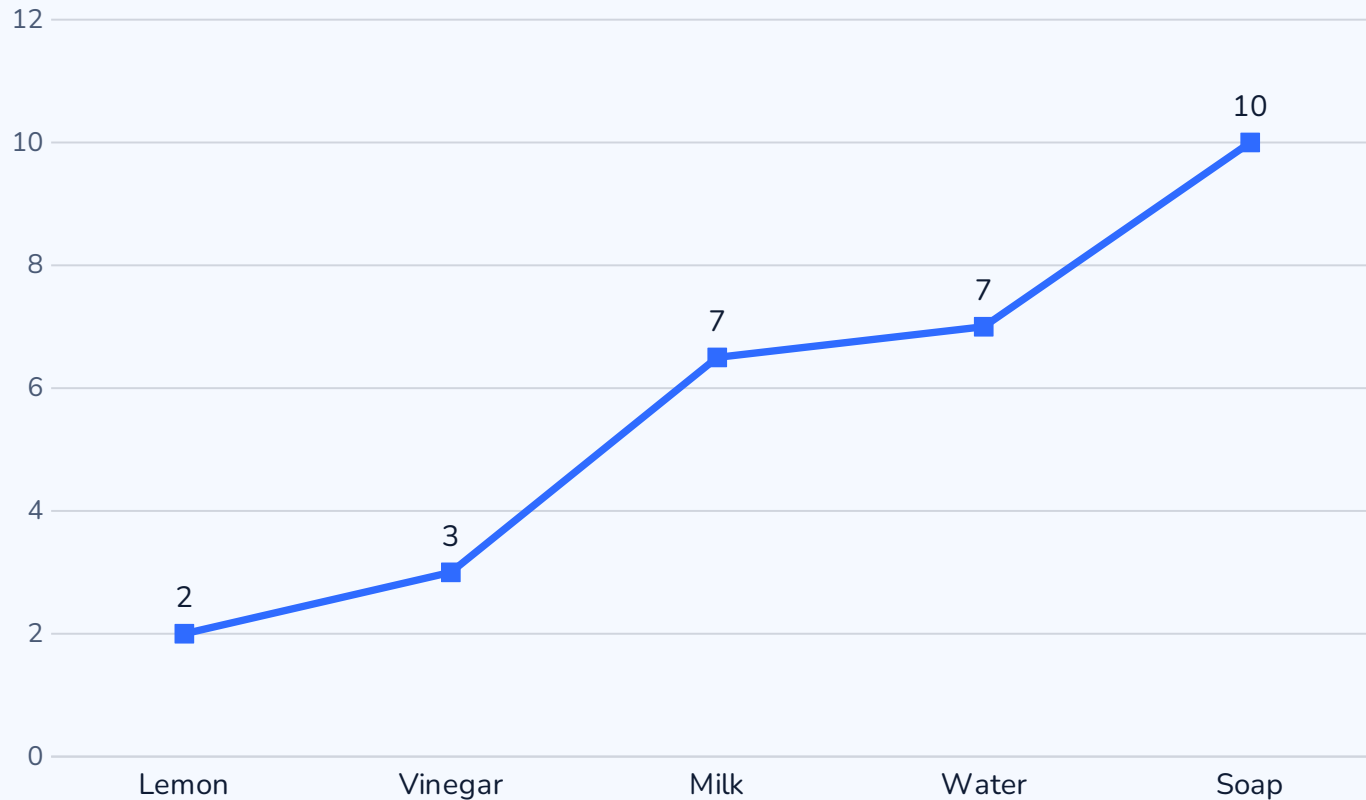
Experiment

- Collect lemon juice, soap water and vinegar
- Dip litmus paper in each
- Note the colour change
- Arrange them on a pH scale

SAFETY

Wear goggles and never taste chemicals.

pH of household items



Approximate pH values (sample data).

Sample data for illustration — replace with your own figures.

Real-world applications



Image 1

Digestion

Stomach acid breaks down food



Image 2

Agriculture

Lime treats acidic soil



Image 3

Medicine

Antacids neutralise acidity

Quick facts

0–14

range of the pH scale

7

is neutral

HCl

acid in our stomach

Summary

- Acids turn blue litmus red
- Bases turn red litmus blue
- Acid + base gives salt + water
- pH measures acidity



Image

07

PHOTOSYNTHESIS



How plants turn light into food

Lecture 7 · Photosynthesis

What is photosynthesis?

Photosynthesis is the process by which green plants use sunlight, water and carbon dioxide to make glucose and release oxygen.

It takes place mainly in the leaves, inside chloroplasts that contain the green pigment chlorophyll. Almost all life on Earth depends on it.



Diagram

Key concepts

01

Chlorophyll

Green pigment that absorbs light energy.

02

Light reactions

Water is split and energy is captured.

03

Calvin cycle

Carbon dioxide is fixed into glucose.

The process

1

Absorb

Chlorophyll absorbs sunlight

2

Split

Water splits, oxygen released

3

Store

Energy stored as ATP and NADPH

4

Build

CO₂ turned into glucose

Factors affecting the rate

Factor	Effect	Limit
Light intensity	Rate rises	Levels off when saturated
CO ₂ level	Rate rises	Levels off at high CO ₂
Temperature	Rises then falls	Enzymes denature above ~40 °C

Reference values for illustration.

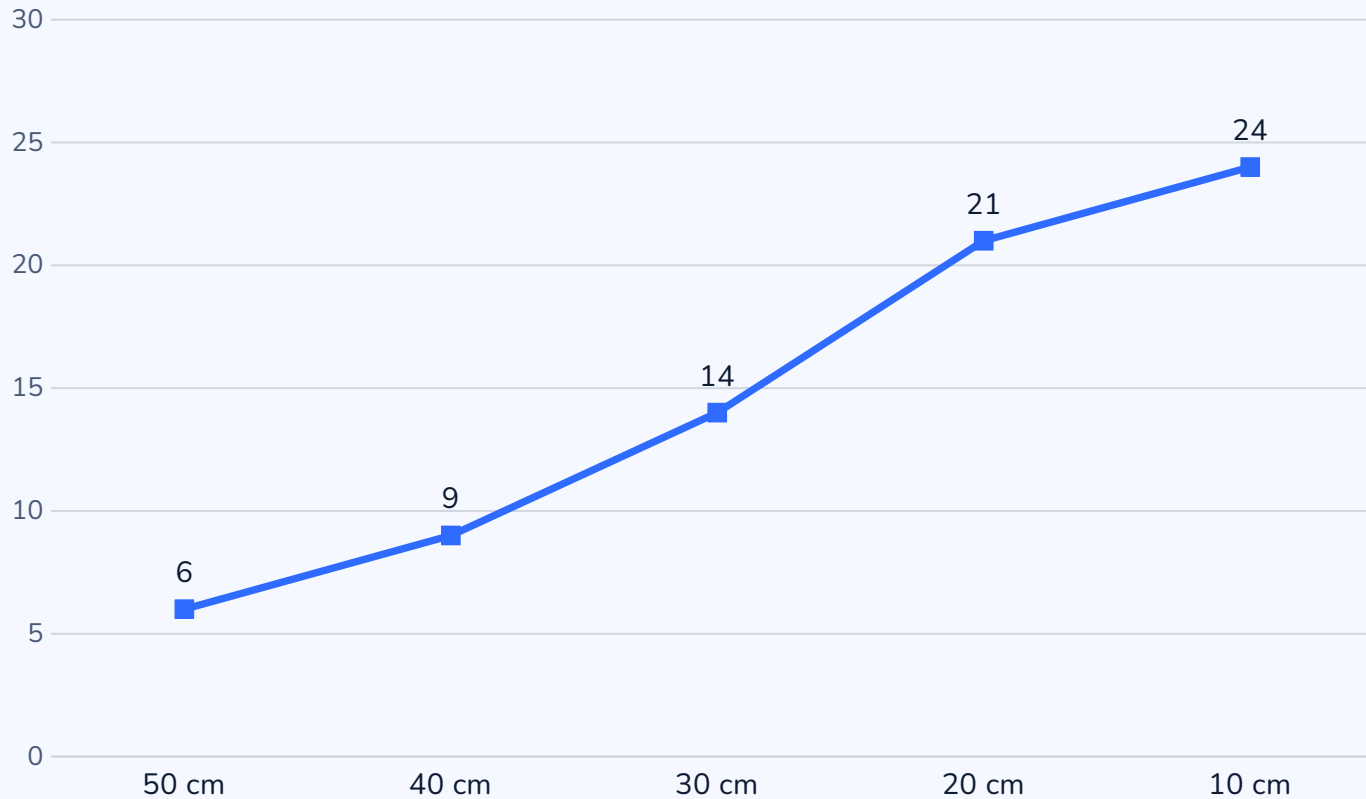
Experiment

- Place a water plant in a beaker under a lamp
- Count oxygen bubbles per minute
- Move the lamp closer in steps
- Record and plot the bubble rate

SAFETY

**Keep water away
from the lamp and
wires.**

Bubble rate vs light distance



Sample data for illustration — replace with your own figures.

More light gives faster photosynthesis until another factor limits it (sample data).

Real-world applications



Image 1

Agriculture

Greenhouses boost light and CO₂



Image 2

Climate

Forests absorb carbon dioxide



Image 3

Energy research

Artificial photosynthesis

Quick facts



~50%

of Earth's oxygen from
ocean algae

1%

of sunlight used by most
plants

Summary

- Plants make food using light, water and CO_2
- Chlorophyll in chloroplasts captures light
- Oxygen is released as a by-product
- Light, CO_2 and temperature control the rate



Image

Thank you

Questions and discussion.

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