CLASS 10

UNIT 1 SCIENTIFIC STUDY

ON THE BASIS OF CDC NEPAL 2082

What is Scientific Research?

Scientific research is a step-by-step process used to find answers to questions or solve problems using science. It helps us discover new knowledge by observing, experimenting, and analyzing.

Stages of Scientific Research

1. **Objectives:**
   This means the main aim or purpose of doing the research. It tells what the scientist wants to find out or solve.
2. **Construction of a Hypothesis:**
   A hypothesis is an idea or possible answer to a problem. It is made before doing experiments and is tested to see if it's correct.
3. **Selection of Data Collection Methods:**
   This means choosing how to collect information. It could be through observation, experiments, surveys, or measurements.
4. **Scientific Listing of Data:**
   After collecting data, it is written or recorded in an organized way using tables, charts, or graphs.
5. **Analysis of Data and Conclusions:**
   Scientists study the data carefully to find patterns and results.

Then, they make conclusions based on what the data shows.

6. **Communicate Results:**
   The findings are shared with others. This can be through reports, presentations, or publications.

Variables and Types

- **Define Variables:**
  Variables are things that can change in an experiment. They affect how the experiment works.
- **Types of Variables:**
  1. **Independent Variable:**
     The variable that is changed on purpose.
     Examples:
     - Temperature of water
     - Type of soil used
  2. **Dependent Variable:**
     The variable that is measured or observed.
     Examples:
     - Speed of plant growth
     - Time to dissolve sugar
  3. **Controlled Variable:**
     Variables that are kept the same during the experiment.
     Examples:
     - Amount of sunlight
     - Volume of water used

Units and Their Types

- **Define Units:**
  A unit is a standard way to measure things like length, mass, or time.
- **Types of Units:**
  1. **Fundamental Units:**
     Basic units that cannot be broken down.
     Examples:
     - Meter (length)
     - Second (time)
  2. **Derived Units:**
     Units made by combining two or more fundamental units.
     Examples:
     - Meter/second (speed)
     - Newton (force)

Standard Systems of Units (Short Form)

- **MKS System:** Meter, Kilogram, Second
- **CGS System:** Centimeter, Gram, Second
- **FPS System:** Foot, Pound, Second
- **SI System:** International System of Units (uses MKS units mostly)

Fundamental Units Evolved into Derived Units (20 Examples)

1. Speed = m/s
2. Acceleration = m/s^2
3. Force = $kg \cdot m/s^2$ = Newton
4. Pressure = N/m^2 = Pascal

5. Energy = N·m = Joule
6. Power = J/s = Watt
7. Density = kg/m³
8. Work = N·m = Joule
9. Momentum = kg·m/s
10. Frequency = 1/s = Hertz
11. Electric Charge = A·s = Coulomb
12. Voltage = J/C = Volt
13. Resistance = V/A = Ohm
14. Current = Coulomb/second = Ampere
15. Heat = Joule
16. Surface Area = m²
17. Volume = m³
18. Velocity = m/s
19. Angular Velocity = rad/s
20. Capacitance = Coulomb/Volt = Farad

Unit Analysis of Equations (5 Examples)

1. Speed = Distance / Time → m/s
2. Force = Mass × Acceleration → kg × m/s² = N
3. Work = Force × Distance → N × m = J
4. Power = Work / Time → J/s = W
5. Pressure = Force / Area → N/m² = Pa

Principle of Homogeneity (5 Examples)

The principle says both sides of an equation must have the same units.

1. $v = u + at$
   $(m/s = m/s + m/s^2 \times s)$
2. $F = ma$
   $(N = kg \times m/s^2)$
3. $s = ut + \frac{1}{2}at^2$
   $(m = m/s \times s + m/s^2 \times s^2)$
4. $W = F \times d$
   $(J = N \times m)$
5. $V = IR$
   $(Volt = Ampere \times Ohm)$

CLASS 10
UNIT 2 CLASSIFICATION OF LIVING BEINGS
ON THE BASIS OF CDC NEPAL 2082

Classification of Living Beings

Definition:

Classification of living beings means putting all living organisms into different groups based on their similarities and differences. It helps scientists to study and understand them easily.

Why is it necessary?

- To make the study of living beings easier.
- To understand how different organisms are related to each other.
- To identify new organisms.
- To know the evolution and origin of life.

Two Kingdom Classification

Discovered by: Carolus Linnaeus

He divided all living things into **two kingdoms**:

1. **Plant Kingdom (Plantae)**
2. **Animal Kingdom (Animalia)**

Features:

- Organisms are grouped as either plants or animals.

- Plants can make food; animals cannot.
- Plants don't move; animals can move.
- Plants have cell walls; animals do not.

Five Kingdom Classification

Discovered by: R.H. Whittaker

He divided living organisms into **five kingdoms**:

1. Monera
2. Protista
3. Fungi
4. Plantae
5. Animalia

Features:

- Based on cell type (prokaryotic/eukaryotic), body structure, mode of nutrition, and reproduction.
- More accurate than the two-kingdom system.
- Groups both simple and complex organisms.
- Shows evolutionary relationships.

Definition and Features of Five Kingdoms

1. Monera

- Made of single cells (unicellular)
- No nucleus (prokaryotic)
- Can make their own food or depend on others
- Found everywhere

Examples: Bacteria, Blue-green algae (Cyanobacteria)

Features:

- Prokaryotic cells
- Unicellular
- Asexual reproduction
- Cell wall present

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2. Protista

- Single-celled organisms with nucleus (eukaryotic)
- Live in water
- Some make food, some eat other organisms
- Some have tail-like structures (flagella)

Examples: Amoeba, Paramecium

Features:

- Eukaryotic
- Mostly unicellular
- Some are autotrophs, some heterotrophs
- Found in aquatic environments

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3. Fungi

- Cannot make their own food (heterotrophic)
- Feed on dead things
- Have cell walls made of chitin
- Can be single or multi-celled

Examples: Mushroom, Bread mold

Features:

- Eukaryotic
- Cell wall made of chitin
- Absorb food from surroundings

- Reproduce by spores

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4. Plantae

- Make their own food by photosynthesis
- Have green pigment (chlorophyll)
- Cannot move
- Have cell walls

Examples: Mango tree, Fern

Features:

- Eukaryotic
- Multicellular
- Autotrophic
- Cell wall made of cellulose

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5. Animalia

- Cannot make their own food
- Can move
- No cell wall
- Complex body systems

Examples: Human, Dog

Features:

- Eukaryotic
- Multicellular
- Heterotrophic
- No cell wall

Plant Kingdom Divided into Four Parts

1. Algae

- Simple, green plants
- Live in water
- No roots, stems, or leaves

Examples: Spirogyra, Chlamydomonas

2. Bryophyta

- Small plants
- Live in moist places
- Have root-like and leaf-like parts

Examples: Moss, Liverwort

3. Gymnosperms

- Seed-producing plants without fruits
- Leaves are needle-like

Examples: Pine, Cycas

4. Angiosperms

- Flowering plants
- Seeds inside fruits

Examples: Mango, Mustard

Angiosperms Divided into Two Parts

1. Monocots

- One seed leaf (cotyledon)
- Parallel leaf veins
- Fibrous roots
- Flowers in multiples of 3

Examples: Rice, Maize, Banana

2. Dicots

- Two seed leaves (cotyledons)
- Net-like leaf veins
- Tap roots
- Flowers in multiples of 4 or 5

Examples: Pea, Mustard, Mango

Difference Between Homeothermic and Poikilothermic Animals

Homeothermic (Warm-blooded)	Poikilothermic (Cold-blooded)
Body temperature remains constant	Body temperature changes withthe environment
Active in all seasons	Less active in cold season
Examples: Birds, Mammals	Examples: Fish, Reptiles

Animal Kingdom Divided into Two Parts

1. **Invertebrates** (No backbone)
2. **Vertebrates** (Have backbone)

Invertebrate Groups (Very Short with 2 Examples)

1. **Porifera** – Simple, holes in body
   Examples: Spongilla, Sycon
2. **Coelenterata** – Hollow body, stinging cells
   Examples: Hydra, Jellyfish
3. **Platyhelminthes** – Flat body
   Examples: Tapeworm, Liver fluke
4. **Nemathelminthes** – Round body

Examples: Ascaris, Hookworm

5. **Annelida** – Segmented body
   Examples: Earthworm, Leech
6. **Arthropoda** – Jointed legs
   Examples: Ant, Butterfly
7. **Mollusca** – Soft body, hard shell
   Examples: Snail, Octopus
8. **Echinodermata** – Spiny skin, live in sea
   Examples: Starfish, Sea urchin

Vertebrate Groups with 4 Features and 2 Examples Each

1. Pisces (Fishes)

- Live in water
- Have fins and gills
- Cold-blooded
- Lay eggs

Examples: Rohu, Shark

2. Amphibia

- Live in water and land
- Moist skin
- Cold-blooded
- Lay eggs in water

Examples: Frog, Toad

3. Reptilia

- Dry, scaly skin
- Cold-blooded
- Lay eggs on land

- Crawl or walk

Examples: Snake, Lizard

4. Aves (Birds)

- Have feathers and wings
- Warm-blooded
- Lay eggs
- Have beaks

Examples: Crow, Pigeon

5. Mammalia

- Have hair or fur
- Warm-blooded
- Give birth to young ones
- Feed milk to babies

Examples: Cow, Human

Relation Between Evolution and Classification

Evolution is the gradual change in living organisms over a long time. Classification shows how different organisms are related through evolution. It groups simple and complex organisms in a way that shows their development. For example, from simple bacteria (Monera) to humans (Animalia), classification helps us understand how life evolved step by step. So, classification is closely related to evolution because it shows the history and progress of life on Earth.

CLASS 10

UNIT 3 HONEY BEE

ON THE BASIS OF CDC NEPAL 2082

About Honeybee

Honeybee is a small insect that lives in a colony. It makes honey and wax. It helps plants grow by spreading pollen. Bees live in a group with a queen, workers, and drones. They build hives and work together. Honeybees are very useful to humans for honey, wax, and helping crops grow.

External Morphology (Very Short Definitions):

- **Head:** Front part with eyes and antennae.
- **Mouthpart:** Used for chewing and sucking nectar.
- **Thorax:** Middle part with wings and legs.
- **Legs:** Six legs used for walking and collecting pollen.
- **Wings:** Two pairs for flying.
- **Abdomen:** Back part with organs and sting.
- **Wax glands:** Glands in abdomen to make wax.

- **Sting:** A sharp organ for defense.

Types of Bees, Their Ages & Three Functions Each:

1. **Queen Bee**
   - **Age:** 2–5 years
   - **Functions:**
     - Lays eggs
     - Controls the hive with pheromones
     - Keeps the colony united
2. **Worker Bee**
   - **Age:** 4–5 weeks
   - **Functions:**
     - Collects nectar and pollen
     - Feeds larvae and queen
     - Builds hive and guards it
3. **Drone Bee**
   - **Age:** 3–4 weeks
   - **Functions:**
     - Mates with queen
     - Does not collect food
     - Dies after mating

Difference Between Drone Bee and Worker Bee:

Drone Bee	Worker Bee
Male bee	Female bee
Mates with queen	Does all hive work

No sting	Has sting
Lives short life	Lives about 5 weeks

Life Cycle of Honeybee .

Honeybee starts life from an egg. Egg turns into a larva, then into a pupa. Finally, it becomes an adult bee. The life cycle is complete in about 21 days. Each stage has different looks and changes.

Stages of Life Cycle .

- **Egg:**
  The queen bee lays small, white, oval eggs in honeycomb cells. One egg is laid in each cell. After 3 days, the egg hatches into a larva. All bees begin their life as an egg.
- **Larva:**
  The larva is like a small white worm. Worker bees feed it royal jelly or pollen. It grows fast and sheds its skin. This stage lasts for 5–6 days before becoming a pupa.
- **Pupa:**
  In this stage, the larva is covered with wax. It changes shape and grows legs, wings, and eyes. This process is called metamorphosis. It takes about 7 days to become an adult.
- **Adult:**
  The fully developed bee comes out of the cell. It becomes a queen, drone, or worker depending on diet and care. Each has different roles in the hive. The adult starts working soon after birth.

Economic Importance of Honeybee.

1. Produces honey, which is nutritious and used in medicine.
2. Makes wax, used in candles and cosmetics.
3. Helps in pollination, increasing crop production.
4. Source of income for beekeepers and farmers.

CLASS 10
UNIT 4 HEREDITY
ON THE BASIS OF CDC NEPAL 2082

Cell Division

Definition:

Cell division is the process in which one cell divides to form two or more new cells. It helps in growth, repair, and reproduction of living things.

Example:

A cut on your skin heals because of cell division.

Types of Cell Division

1. **Amitosis (Direct Cell Division)**
   The cell divides directly without any special steps. It is seen in simple organisms like *Amoeba*.
2. **Mitosis**
   One cell divides into two identical cells. It occurs in body cells for growth and repair.
3. **Meiosis**

One cell divides into four cells, each with half the number of chromosomes. It happens in reproductive cells (like sperm and egg).

Mitosis Cell Division

Has 4 stages:

1. **Prophase** – Chromosomes become visible, and the nuclear membrane starts disappearing.
2. **Metaphase** – Chromosomes line up in the center of the cell.
3. **Anaphase** – Chromosomes split and move to opposite sides.
4. **Telophase** – New nuclear membranes form around each group of chromosomes.

Significance of Mitosis

- Helps in growth of the body
- Repairs damaged tissues
- Replaces old and dead cells
- Keeps chromosome number the same

Meiosis Cell Division

Meiosis I (Heterotypic/Reduction division):

Reduces chromosome number to half.

Prophase I (Has 5 sub-stages):

1. **Leptotene** – Chromosomes become visible.
2. **Zygotene** – Chromosomes start pairing.
3. **Pachytene** – Chromosomes exchange parts.
4. **Diplotene** – Paired chromosomes begin to separate.

5. **Diakinesis** – Final stage before next phase.

Metaphase I – Pairs of chromosomes line up in the center.

Anaphase I – Pairs are pulled apart.

Telophase I – New nuclei form.

Meiosis II (Homotypic/Equational division):

Looks like mitosis; splits the two cells again.

Prophase II – New spindles form.

Metaphase II – Chromosomes line up again.

Anaphase II – Chromosomes split.

Telophase II – Four cells form.

Significance of Meiosis

- Forms sex cells (sperm/egg)
- Reduces chromosome number
- Increases variation in living beings
- Helps in sexual reproduction

Difference between Mitosis and Meiosis

Mitosis	Meiosis
Two identical cells formed	Four different cells formed
Happens in body cells	Happens in sex cells
Chromosome number stays same	Chromosome number becomes half
One division	Two divisions

Chromosome

Chromosomes are thread-like structures found in the nucleus of cells. They carry genes and control traits. They are made of DNA and proteins.

Chromosome Number

Definition: The total number of chromosomes in a cell.

Examples:

Organism	Chromosome Number
Human	46
Dog	78
Cat	38
Onion	16
Rice	24
Pea	14
Horse	64
Frog	26
Mosquito	6
Fruit fly	8

Autosomes and Sex Chromosomes

Autosomes – Control body traits. Example: humans have 44 autosomes.

Sex Chromosomes – Decide the sex of a person. Example: XX = female, XY = male.

Sex Determination .

Sex is determined by sex chromosomes. If a child gets an X chromosome from both parents, it's a girl (XX). If the child gets an X from the mother and Y from the father, it's a boy (XY). The father's sperm decides the baby's sex.

Shape and Size of Chromosome

Chromosomes are rod-shaped and vary in size. Some are long, others are short.

Types of Chromosomes (by shape and position)

1. **Acentric** – No centromere
2. **Telocentric** – Centromere at one end
3. **Acrocentric** – Centromere very close to one end
4. **Submetacentric** – Centromere slightly off-center
5. **Metacentric** – Centromere at the center

Define:

- **Chromomere** – Bead-like structures on chromosomes.
- **Centromere** – Middle part that joins two arms of chromosome.
- **Homologous Chromosome** – Pair of chromosomes with same genes from mother and father.

Four Functions of Chromosomes

1. Control inheritance
2. Carry genes

3. Control cell activities
4. Help in cell division

Difference between DNA and RNA

DNA	RNA
Double-stranded	Single-stranded
Found in nucleus	Found in cytoplasm and nucleus
Controls inheritance	Helps in protein making

Genetics

Definition: The study of inheritance and how traits are passed from parents to offspring.

Father of Genetics: Gregor Johann Mendel

Terms:

- **Gene** – Unit of inheritance
- **Inheritance** – Passing traits from parents to children
- **Variation** – Differences between individuals
- **Traits** – Features like height or eye color
- **Homozygous** – Same kind of gene (TT or tt)
- **Heterozygous** – Different gene (Tt)
- **Hybrid** – Offspring from different parents
- **Dominant** – Strong gene (T)
- **Recessive** – Hidden gene (t)
- **Dwarf** – Short plant or animal (tt)
- **Phenotype** – Physical appearance

- **Genotype** – Genetic makeup (TT, Tt, tt)

Four Reasons Mendel Chose Pea Plant

1. Grows quickly
2. Has many clear traits
3. Easy to cross
4. Self-pollinates

Mendel's Laws

1. **Law of Dominance** – Strong trait shows over weak
2. **Law of Segregation** – Traits separate during gamete formation
3. **Law of Independent Assortment** – Traits pass independently

Mendel's Laws in Detail

Gregor Mendel, the father of genetics, discovered three fundamental laws of inheritance through his experiments with pea plants. These laws explain how traits are passed from parents to offspring.

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1. Law of Dominance

Definition:

The Law of Dominance states that when two different alleles (forms of a gene) are present in an organism, one allele will dominate over the other. The dominant allele shows its trait, while the recessive allele's trait remains hidden or "masked."

Explanation:

In every pair of genes, one gene comes from the mother and the

other from the father. One of these genes could be dominant (stronger), and the other could be recessive (weaker). The dominant gene determines the organism's trait, while the recessive gene's effect is masked unless both alleles are recessive.

Example:

- For the pea plant flower color, *Purple (P)* is dominant over *White (p)*.
- If a plant has a genotype of *Pp* (where *P* is purple and *p* is white), the purple flower will show because *P* (purple) is dominant over *p* (white).
- Only when both alleles are *pp* will the white flower appear, as there is no dominant *P* allele to hide the *p*.

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2. Law of Segregation

Definition:

The Law of Segregation states that during the formation of gametes (sperm and egg cells), the two alleles for each trait separate, so that each gamete receives only one allele from each pair.

Explanation:

Each organism has two alleles for every gene—one from the mother and one from the father. When gametes are formed during meiosis, the alleles for a trait segregate (separate) so that each gamete carries only one allele for each trait. This ensures that offspring inherit one allele from each parent, maintaining genetic

diversity.

Example:
Consider a pea plant with the genotype *Pp* (where *P* is purple and *p* is white).

- During gamete formation, the two alleles (*P* and *p*) will segregate, so half the gametes will carry the *P* allele and the other half will carry the *p* allele.
- When these gametes combine with gametes from another plant (e.g., *Pp* or *pp*), the offspring's genotype will be determined.

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3. Law of Independent Assortment

Definition:
The Law of Independent Assortment states that alleles for different traits are inherited independently of one another. This means the inheritance of one trait does not affect the inheritance of another trait.

Explanation:
In diploid organisms (like humans and pea plants), there are two sets of chromosomes, and each set carries alleles for various traits. When gametes are formed, the alleles for one trait separate independently from the alleles for other traits. This results in various combinations of traits in the offspring.

Example:

Mendel also studied the inheritance of seed color and seed shape in pea plants. Let's say:

- *Y* represents yellow seeds (dominant) and *y* represents green seeds (recessive).
- *R* represents round seeds (dominant) and *r* represents wrinkled seeds (recessive).

If a plant has the genotype *YyRr*, the alleles for seed color (*Y*, *y*) will assort independently from the alleles for seed shape (*R*, *r*).

- This means that a gamete could carry either *YR*, *Yr*, *yR*, or *yr* combinations.
- When these gametes combine with gametes from another plant, the offspring will have different combinations of seed color and shape, showing genetic diversity.

Human Genetic Characters (4 points)

- Eye color
- Hair type
- Skin color
- Blood group

Introduction to Genetic Technology .

Genetic technology is used to change the genes of organisms for better results. It helps in improving crops, making medicine, and

solving crimes. Scientists use it to find diseases and cure them by changing genes.

Tools for Genetic Engineering

- **Enzymes** – Cut and join DNA
- **Vectors** – Carry genes into cells
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Enzymes : Enzymes like restriction enzymes cut DNA at specific spots, and ligase joins pieces of DNA.

Vector : Vectors are tools like plasmids or viruses that carry new genes into other organisms during genetic engineering.

Define:

- **Recombinant DNA** – DNA formed by combining genes from different sources
- **Genetically Modified Organism (GMO)** – Living being with changed genes
- **Genetic Engineering Breaks the Species Barrier** – Genes from one species can be used in another

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Genetic Engineering Applications .

Plants: Improves crops to resist disease, grow faster, and produce more food.
Animals: Used to produce more milk, meat, or grow faster.
Microorganisms: Used to make medicines like insulin, and clean oil

spills.

Role of DNA Test .

1. Identify people in crimes
2. Find parents (paternity test)
3. Detect genetic diseases
4. Identify dead bodies

Traditional Breeding Methods .

In traditional methods, farmers select best plants and animals for breeding. They choose the ones with good traits like bigger size or more yield. It is a slow process and depends on natural crossing or selection.

Problems of Selective Breeding (2 points)

1. Takes a long time
2. Limited genetic variation

Cross Breeding

Definition: Mating of two different breeds to produce better offspring.

Examples:

- Cow × buffalo = hybrid
- Horse × donkey = mule
-

Advantages (4 points):

1. Increases yield

2. Disease resistance
3. Stronger offspring
4. More adaptable
5.

Disadvantages (4 points):

1. Can lose original traits
2. May be infertile
3. Expensive
4. May not survive long

In Vitro Fertilization (IVF) .

IVF is a method to help couples who can't have children naturally. In this process, a woman's egg is taken and mixed with a man's sperm in a lab. After fertilization, the embryo is placed in the woman's womb. It helps those with blocked tubes, low sperm count, or unknown reasons for infertility. IVF is safe but expensive.

4 Steps of IVF:

1. Egg collection
2. Sperm collection
3. Fertilization in lab
4. Embryo transfer

Test Tube Baby – Short Steps

1. Collect egg and sperm
2. Fertilize in lab
3. Grow embryo

4. Transfer to womb

3 Advantages:

1. Helps infertile couples
2. Healthy babies possible
3. Prevents genetic diseases

4 Problems:

1. Expensive
2. Emotional stress
3. Not always successful
4. Multiple births

Artificial Insemination .

Artificial insemination is a process of placing sperm into a female's reproductive system without natural mating. It is used in both humans and animals to help reproduction. In this method, sperm from a healthy male is collected and inserted into the female's uterus. It helps couples facing infertility and is used in animals to improve breeds. It is safe, simple, and low-cost compared to IVF. It also avoids diseases passed during natural mating and increases chances of pregnancy using stored or donor sperm.

CLASS 10

UNIT 7 FORCE AND MOTION

ON THE BASIS OF CDC NEPALL 2082

1. Forces and Motions with Examples:

- **Force**: Force is a push or pull that can change the state of motion of an object. It can make an object start moving, stop,

or change its direction.
    - **Example**: When you push a ball, the force you apply makes it move.
- **Motion**: Motion is the change in the position of an object with respect to time.
    - **Example**: A car moving on a road is an example of motion.

2. Gravitational Force and Four Effects of Gravitational Force:

- **Gravitational Force**: It is the force of attraction that pulls objects towards the center of the Earth or any other celestial body.
- **Effects of Gravitational Force**:
    1. It causes objects to fall towards the Earth when dropped.
    2. It holds the atmosphere around the Earth.
    3. It causes tides due to the pull of the moon.
    4. It keeps the planets in orbit around the Sun.

3. Gravity and Four Effects of Gravity:

- **Gravity**: Gravity is the force that attracts objects towards the center of the Earth. It is responsible for the weight of an object.
- **Effects of Gravity**:
    1. It makes objects fall towards the Earth.
    2. It keeps the planets in orbit.
    3. It causes objects to have weight.
    4. It affects the movement of tides in the oceans.

4. Difference Between Gravitational Constant and Acceleration Due to Gravity:

- **Gravitational Constant (G)**: It is a constant value that

describes the strength of gravitational force between two masses. Its value is 6.67×10^{-11} N·m²/kg².

- **Acceleration Due to Gravity (g)**: It is the acceleration experienced by an object due to the gravitational pull of the Earth. Its value is approximately 9.8 m/s² near the Earth's surface.

5. Difference Between Mass and Weight:

- **Mass**: Mass is the amount of matter in an object and is constant everywhere. It is measured in kilograms (kg).
- **Weight**: Weight is the force exerted by gravity on an object. It depends on the gravitational pull and is measured in newtons (N). Weight = Mass × Gravity ($W = m \times g$).

6. Difference Between Gravity and Gravitation:

- **Gravity**: Gravity is the force that attracts objects towards the center of the Earth (or any other planet).
- **Gravitation**: Gravitation is the universal force of attraction that exists between any two objects with mass.

7. Relationship Between Weight, Mass, and Acceleration Due to Gravity:

- The weight of an object is directly proportional to its mass and the acceleration due to gravity.
  - **Formula**: Weight (W) = Mass (m) × Acceleration Due to Gravity (g)

8. Relationship Between Acceleration Due to Gravity and Radius of Earth:

- The acceleration due to gravity is inversely proportional to the square of the radius of the Earth.

- **Formula**: $g \propto 1/r^2$ (where r is the radius of the Earth)

9. Verification of Newton's Universal Law of Gravitation:

- **Newton's Universal Law of Gravitation**: It states that every object in the universe attracts every other object with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.
  - **Formula**: $F = G \times (m_1 \times m_2) / r^2$, where F is the force of attraction, m_1 and m_2 are the masses, r is the distance, and G is the gravitational constant.
  - **Verification**: This law is verified by experiments showing the attraction between two masses and calculating the force using the formula.

10. What Happens When Mass is Halved or Doubled or Radius is Changed:

- **Mass Half**: If the mass of one or both bodies is halved, the gravitational force will be halved as well.
- **Mass Doubled**: If the mass of one or both bodies is doubled, the gravitational force will be doubled.
- **Radius Half**: If the distance (radius) between two bodies is halved, the gravitational force will increase four times (since force is inversely proportional to the square of the distance).
- **Radius Double**: If the distance (radius) between two bodies is doubled, the gravitational force will decrease by a factor of four.

11. Aristotle's and Galileo's Ideas of Falling Bodies:

- **Aristotle's Idea**: Aristotle believed that heavier objects fall

faster than lighter ones.

- **Galileo's Idea**: Galileo proved that, in the absence of air resistance, all objects fall at the same rate, regardless of their mass.

12. Define Freefall:

- **Freefall**: Freefall is the motion of an object when it is falling under the influence of gravity only, with no other forces acting on it, such as air resistance. In freefall, objects accelerate at the same rate, irrespective of their mass.

13. Define Weightlessnes:

- **Weightlessness**: Weightlessness occurs when an object or a person is in freefall, experiencing no normal force acting on them. Although gravity still acts on the object, the sensation of weight is absent because the object is falling at the same rate as its surroundings.

14. Define Acceleration Due to Gravity:

- **Acceleration Due to Gravity**: It is the rate at which an object's velocity changes due to the gravitational pull of the Earth. It is approximately 9.8 m/s^2 near the Earth's surface.

15. Variations of Acceleration Due to Gravity Due to Shape of Earth:

- The acceleration due to gravity is slightly stronger at the poles and weaker at the equator due to the Earth's slightly oblate shape (flattened at the poles and bulging at the equator).

16. Variations of Acceleration Due to Gravity Due to Altitude:

- As the altitude increases (when you go higher above the Earth's surface), the acceleration due to gravity decreases

because the distance from the Earth's center increases.

17. The Variation of Acceleration Due to Gravity with Depth:

- As you go deeper into the Earth, the acceleration due to gravity decreases because the distance from the Earth's center decreases.

18. Acceleration Due to Gravity on the Surface of the Moon:

- The acceleration due to gravity on the Moon is approximately 1.6 m/s^2, which is about 1/6th of that on Earth.

19. Acceleration Due to Gravity on the Surface of Jupiter:

- The acceleration due to gravity on the surface of Jupiter is approximately 24.8 m/s^2, which is much higher than on Earth due to Jupiter's larger mass and size.

CLASS 10

UNIT 6 NATURE AND ENVIROMENT

ON THE BASIS OF CDC NEPAL 2082

Nature and Environment

Nature refers to the natural world and everything in it that is not

created by humans, such as trees, animals, rivers, mountains, and the atmosphere. The environment is the surroundings where all living and non-living things exist, including the air, water, and land.

Climate Change

Climate change refers to the long-term changes in the Earth's weather patterns and temperature. It can be caused by both natural processes and human activities. Climate change has become a major environmental concern because it affects weather, sea levels, and biodiversity.

Atmosphere

The atmosphere is the layer of gases surrounding the Earth. It includes oxygen, nitrogen, and other gases that are essential for life. The atmosphere also regulates the Earth's temperature by trapping heat, which is known as the greenhouse effect.

Factors Affecting Climate Change

1. **Greenhouse gases**: Release of gases like carbon dioxide and methane traps heat in the Earth's atmosphere.
2. **Deforestation**: Cutting down trees reduces the Earth's ability to absorb carbon dioxide.
3. **Industrial activities**: Factories release pollutants that harm the environment.

4. **Burning fossil fuels**: Gas, coal, and oil release harmful gases into the atmosphere.
5. **Waste production**: Large amounts of waste, especially plastic, cause environmental harm.
6. **Agriculture**: Farming activities release methane and nitrous oxide into the air.

Causes of Climate Change

1. **Burning fossil fuels**: Releases carbon dioxide into the atmosphere, trapping heat.
2. **Deforestation**: Trees absorb carbon dioxide, and when cut down, more carbon is released.
3. **Industrial emissions**: Factories release harmful gases into the air.
4. **Agricultural practices**: Livestock produce methane, a potent greenhouse gas.
5. **Waste management**: Decomposing waste emits methane.
6. **Overuse of resources**: Exploiting natural resources leads to environmental degradation.

Effects of Climate Change

1. **Rising temperatures**: Global warming causes higher temperatures.
2. **Melting ice caps**: Polar ice caps are melting, raising sea levels.
3. **Extreme weather**: More frequent hurricanes, floods, and

droughts.
4. **Loss of biodiversity**: Many species cannot survive changing conditions.
5. **Agricultural impacts**: Crop yields may decrease due to changing weather patterns.
6. **Health risks**: Higher temperatures lead to health problems like heat stroke and diseases.

Measures to Reduce Climate Change

1. **Reduce energy consumption**: Use energy-efficient appliances and technologies.
2. **Use renewable energy**: Solar, wind, and hydropower energy are eco-friendly alternatives.
3. **Afforestation**: Planting trees to absorb carbon dioxide and prevent soil erosion.
4. **Waste reduction**: Reducing waste minimizes harmful emissions.
5. **Public awareness**: Educating people on climate change impacts and solutions.
6. **Use of public transport**: Reduces vehicle emissions.

National and International Initiatives for Climate Change

National Communications Report: A report prepared by countries to share their progress in addressing climate change, outlining actions taken and the challenges faced.

Climate Change Policy 2067: Nepal's strategy to address climate change by reducing greenhouse gases, improving adaptation, and strengthening environmental laws.

Strategies for Mitigation of Climate Change: Nepal focuses on reducing emissions, enhancing sustainable practices, and adopting clean technologies to reduce the effects of climate change.

National Adaptation Programme of Action: A plan to help countries adapt to the adverse effects of climate change, particularly in vulnerable sectors like agriculture and health.

Local Adaptation Plan for Action: Local-level plans to increase resilience to climate change by involving communities in sustainable practices and resource management.

Other Programs: Various national and international programs focus on climate adaptation, including financial aid for vulnerable communities and technology transfer.

International Initiatives for Climate Change

Kyoto Protocol: An international treaty that commits countries to reduce greenhouse gas emissions based on the principle of common but differentiated responsibilities.

Kyoto Protocol's Mechanisms:

1. **Emissions trading**: Countries with extra emission allowances can trade with those who have exceeded their limits.
2. **Joint implementation**: Projects in one country can earn emission reduction credits for another.
3. **Clean development mechanism**: Allows developed countries to invest in emission-reducing projects in developing countries.

Intergovernmental Panel on Climate Change (IPCC): A body that assesses climate change science and its effects on the environment.

Agenda 21: A global action plan for sustainable development addressing environmental and social issues.

Reducing Emissions from Deforestation and Forest Degradation (REDD): An initiative to reduce emissions by protecting forests from deforestation and degradation.

Our Role to Address Climate Change

1. **Save energy**: Turn off lights and appliances when not in use to reduce energy consumption.
2. **Promote renewable energy**: Support the use of solar, wind, and hydropower energy sources.
3. **Recycle**: Reduce waste by reusing and recycling materials.

4. **Use recyclable products**: Choose products that are recyclable to reduce environmental impact.
5. **Afforestation**: Plant trees to absorb carbon dioxide and maintain the balance of ecosystems.
6. **Sharing information**: Spread awareness about climate change to encourage sustainable practices among family and friends.

Endangered Animals of Nepal and Their Conservation

Endangered Animal: An animal species at risk of extinction due to various threats like habitat loss and poaching.
Conservation of Animals: Efforts to protect endangered species through legal protection, habitat conservation, and breeding programs.

Measures to Protect Endangered Animals

1. **Ban on legal hunting and poaching**: Strict laws prevent hunting and killing of endangered species.
2. **Decrease effect of human activities**: Reduce pollution and deforestation to protect animal habitats.
3. **Conservation of habitat**: Protecting and preserving the natural habitat of endangered species.
4. **Awareness campaign**: Educating the public on the importance of wildlife conservation.
5. **Public participation**: Involve communities in conservation efforts to ensure long-term success.

Identification and Applications of Medicinal Herbs

Tulsi: Known for its healing properties, it is used for treating colds, stress, and inflammation.

1. Treats cold and cough.
2. Reduces stress and anxiety.
3. Improves digestion.
4. Enhances immunity.

Ghyukumari (Aloe Vera): Known for skin benefits, it treats burns, wounds, and digestion issues.

1. Heals burns and wounds.
2. Soothes digestive issues.
3. Moisturizes skin.
4. Treats skin irritations.

Bojho: Helps with digestion, detoxifying the body and relieving pain.

1. Improves digestion.
2. Detoxifies the body.
3. Relieves pain.
4. Strengthens the immune system.

Gurjo (Indian Berberry): Known for its anti-inflammatory properties, it treats fever, infections, and liver issues.

1. Treats fever and infections.
2. Reduces inflammation.
3. Improves liver function.
4. Heals wounds.

Ghodtapre (Indian Pennywort): Used for enhancing brain function, treating wounds, and improving circulation.

1. Improves memory and brain function.
2. Heals wounds.
3. Reduces blood pressure.
4. Enhances circulation.

Titepati (Wild Mint): Used for digestive problems, colds, and inflammation.

1. Relieves indigestion.
2. Reduces cold symptoms.
3. Eases inflammation.
4. Improves appetite.

Neem: Known for its antibacterial and antiviral properties, it helps with skin issues and immune health.

1. Treats skin infections.
2. Improves oral hygiene.
3. Enhances immunity.
4. Reduces fever.

Yarsagumba (Cordyceps): A rare herb used for enhancing stamina and improving energy levels.

1. Boosts stamina and energy.
2. Improves sexual health.
3. Enhances athletic performance.
4. Strengthens immunity.

CLASS 10

UNIT 7 FORCE AND MOTION

ON THE BASIS OF CDC NEPAL 2082

Forces and Motion:

Force: A force is a push or pull that can change the shape, direction, or speed of an object. For example, pushing a door to

open it or pulling a cart.

Motion: Motion is the change in position of an object over time. For example, a moving car or a falling apple.

Gravitational Force:

Gravitational Force: It is the force of attraction between two objects due to their mass. For example, the Earth pulls everything towards itself because of gravity.

Effects of Gravitational Force:

1. It keeps the planets in orbit around the Sun.
2. It causes objects to fall towards the Earth.
3. It gives us weight.
4. It causes tides in the ocean due to the Moon's gravity.

Gravity:

Gravity: Gravity is the force that attracts objects towards the center of the Earth (or any other large body).

Effects of Gravity:

1. It causes objects to fall when dropped.
2. It keeps us and everything else anchored to the Earth.
3. It keeps the Earth and other planets in orbit around the Sun.
4. It affects the flow of water and air.

Difference Between Gravitational Constant and Acceleration Due to Gravity:

1. **Gravitational Constant (G)**: It is a constant value that represents the strength of gravity between two masses. Its value is 6.67×10−11 N m2/kg26.67 \times 10^{-11} \, \text{N m}^2/\text{kg}^2.
2. **Acceleration Due to Gravity (g)**: It is the acceleration experienced by an object when it is in free fall near the Earth's surface. Its value on Earth is 9.8 m/s29.8 \, \text{m/s}^2.

Difference Between Mass and Weight:

1. **Mass**: Mass is the amount of matter in an object. It does not change with location. It is measured in kilograms (kg).
2. **Weight**: Weight is the force exerted by gravity on an object. It depends on the mass and the acceleration due to gravity and is measured in newtons (N).

Difference Between Gravity and Gravitation:

1. **Gravity**: Gravity is the force that attracts objects towards the center of the Earth or any other large body.
2. **Gravitation**: Gravitation is the force of attraction between all objects with mass. Gravity is a special case of gravitation related to Earth.

Relationship Between Weight, Mass, and Acceleration

Due to Gravity:

Weight (W) = Mass (m) × Acceleration due to gravity (g)
This means an object's weight is the force with which gravity pulls it towards the Earth, and it depends on both the mass of the object and the strength of gravity.

Relationship Between Acceleration Due to Gravity and Radius of Earth:

As the radius of the Earth increases, the value of acceleration due to gravity decreases. This is because gravity weakens with distance from the Earth's center.

Verification of Newton's Universal Law of Gravitation:

Newton's law states that every mass attracts every other mass with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. **Formula**:
F=G·m1·m2r2F = \frac{G \cdot m_1 \cdot m_2}{r^2}
Where:

- FF = Gravitational force
- GG = Gravitational constant
- m1,m2m_1, m_2 = Masses of the two objects
- rr = Distance between the centers of the two masses

Effects of Changing Mass and Radius on Gravitational Force:

1. **Mass Half**: If one mass is halved, the gravitational force between two bodies will also become half.
2. **Mass Double**: If one mass is doubled, the gravitational force will also double.
3. **Radius Half**: If the radius is halved, the gravitational force will increase by four times.
4. **Radius Double**: If the radius is doubled, the gravitational force will decrease by a factor of four.

Aristotle's Ideas on Falling Bodies:

Aristotle believed that heavier objects fall faster than lighter ones. He thought that the speed of an object's fall depends on its weight.

Galileo's Ideas on Falling Bodies:

Galileo challenged Aristotle by showing that all objects, regardless of their weight, fall at the same rate in the absence of air resistance. He did this with his famous experiment using balls of different weights.

Freefall:

Freefall is the motion of an object when it is falling solely under the influence of gravity, with no other forces acting on it. During freefall, all objects fall at the same rate regardless of their mass.

Weightlessness:

Weightlessness occurs when an object is in freefall and experiences no contact force. Astronauts feel weightless in space because they are in a constant state of freefall around the Earth.

Acceleration Due to Gravity:

Acceleration Due to Gravity (g) is the rate at which an object's speed increases as it falls towards the Earth. Its value near the Earth's surface is approximately 9.8 m/s29.8 \, \text{m/s}^2.

Variations of Acceleration Due to Gravity:

1. **Due to the Shape of Earth**: Gravity is slightly weaker at the poles and stronger at the equator because the Earth is not a perfect sphere but an oblate spheroid.
2. **Due to Altitude**: As you go higher above the Earth's surface, the acceleration due to gravity decreases because you are farther from the Earth's center.
3. **With Depth**: As you go deeper into the Earth, the acceleration due to gravity decreases because the mass beneath you reduces.

Acceleration Due to Gravity on the Surface of the Moon:

The acceleration due to gravity on the Moon is about 1.6 m/s21.6 \, \text{m/s}^2, which is about one-sixth of the value on Earth.

Acceleration Due to Gravity on the Surface of Jupiter:
The acceleration due to gravity on Jupiter is about 24.79 m/s224.79 \, \text{m/s}^2, which is more than twice the value on Earth.

CLASS 10

UNIT 8 PRESSURE

ON THE BASIS OF CDC NEPAL 2082

Pressure Definition

Pressure is defined as the force exerted per unit area of a surface. The formula for pressure is:

Pressure=ForceArea\text{Pressure} = \frac{\text{Force}}{\text{Area}}
The SI unit of pressure is the **Pascal (Pa)**, where 1 Pa = 1 Newton per square meter (N/m^2).

8 Applications of Pressure in Daily Life

1. **Bicycles:** Air pressure inside the tires helps in smooth movement.
2. **Car brakes:** Hydraulic pressure helps to apply force on the brake pads.
3. **Water supply systems:** Pressure in pipes ensures water flows smoothly.
4. **Buildings and construction:** Engineers calculate pressure on materials to ensure stability.
5. **Medicine:** Blood pressure monitoring helps detect health conditions.
6. **Airplanes:** Pressure difference between inside and outside helps planes to fly.
7. **Cooking (pressure cookers):** Pressure helps cook food faster.
8. **Plumbing systems:** Water pressure helps in distributing water across buildings.

Pressure on Liquids and its Depth

The pressure in a liquid increases with depth due to the weight of the liquid above. The deeper you go into a liquid, the more

pressure you experience.

Factors Affecting Liquid Pressure

1. **Depth of the liquid:** The deeper you go, the greater the pressure.
2. **Density of the liquid:** Denser liquids create more pressure at a given depth.
3. **Gravitational force:** The pressure depends on gravity, which pulls down the liquid.

Pascal's Law in Liquids

Pascal's law states that **"Pressure applied to an enclosed fluid is transmitted equally in all directions."** This means if pressure is applied to a liquid in a container, it spreads throughout the liquid.

Applications of Pascal's Law

1. **Hydraulic Press:** A hydraulic press works by applying pressure on a small piston. The pressure is transmitted to a larger piston, which exerts a greater force on objects placed under it. It is used to compress materials like metal.
2. **Hydraulic Car Brake:** In a hydraulic car brake, when you press the brake pedal, pressure is applied to a fluid inside the brake system. This pressure forces the brake pads to push against

the wheels, slowing down or stopping the car.

Thrust and Upthrust

1. **Thrust:** Thrust is the force exerted by a body in a specific direction, often related to objects moving through air or water.
2. **Upthrust:** Upthrust is the upward force exerted by a fluid on an object placed in it. It opposes the object's weight and can make objects float in water.

Measuring Upthrust

Upthrust can be measured by the difference in the weight of an object when it is in air and when it is submerged in a fluid. The upthrust is equal to the loss in weight when submerged.

Difference Between Density and Relative Density

1. **Density:** Density is the mass per unit volume of a substance. It is measured in kilograms per cubic meter (kg/m^3).
2. **Relative Density:** Relative density is the ratio of the density of a substance to the density of water. It is a pure number with no units.

Difference Between Liquid Pressure and Resultant Pressure

1. **Liquid Pressure:** This is the pressure exerted by a liquid on an object submerged in it due to the depth and density of the liquid.
2. **Resultant Pressure:** This is the total pressure acting on an object when several forces (such as liquid pressure, atmospheric pressure, etc.) are combined.

Relationship Between Density and Upthrust

The denser the fluid, the greater the upthrust exerted on an object. This is why objects float better in denser fluids.

Archimedes' Principle and Explanation

Archimedes' Principle states that **"An object submerged in a fluid experiences an upward buoyant force equal to the weight of the fluid it displaces."** This explains why objects float or sink depending on their density relative to the fluid.

Limitations of Archimedes' Principle

1. It only applies to fluids (liquids and gases).
2. It doesn't account for objects with irregular shapes that don't displace fluid uniformly.
3. It's only valid for situations where the fluid is at rest.

Applications of Archimedes' Principle

1. **Ships and Submarines:** They float due to the upthrust, which is determined by the principle.
2. **Hydrometers:** Used to measure the density of liquids by observing the displacement caused by the liquid.

Law of Floatation

The **Law of Floatation** states that **"A floating object displaces its own weight of the fluid in which it floats."** In simple terms, an object will float if the buoyant force (upthrust) is equal to its weight.

Application of Law of Floatation

The law helps us understand why large ships made of heavy materials like steel float. They displace enough water to counterbalance their weight, allowing them to stay afloat.

CLASS 10

UNIT 9 HEAT

ON THE BASIS OF CDC NEPAL 2082

Thermal Energy

Thermal energy refers to the total energy of the particles (atoms or molecules) within a substance. It depends on both the temperature of the substance and the number of particles present. The faster the particles move, the more thermal energy is present.

Heat Energy

Heat energy is the energy transferred from one object or substance to another due to a difference in temperature. It always flows from the hotter object to the cooler one until both reach the same temperature, a process known as thermal equilibrium.

Temperature

Temperature is a measure of how hot or cold a substance is. It indicates the average kinetic energy of the particles in a substance. A higher temperature means faster particle movement, while a lower temperature means slower movement.

Effect of Heat on Volume

When a substance is heated, its particles move faster and spread out. This causes the substance to expand, increasing its volume. The increase in volume with temperature is called thermal expansion. This effect can be observed in solids, liquids, and gases.

Anomalous Expansion of Water

Water exhibits anomalous expansion between 0°C and 4°C. Unlike most substances, water contracts when cooled, but as it approaches 0°C, it expands. This behavior is why ice floats on

water, as its density decreases below 4°C. This anomaly plays a crucial role in maintaining aquatic life during cold weather.

Effect of Anomalous Expansion of Water

- **Aquatic Life**: The anomalous expansion of water ensures that the surface of lakes and ponds freezes first, allowing aquatic life to survive in the liquid water beneath.
- **Bottle Burst**: When water freezes and expands in a bottle, the ice can cause the bottle to burst due to the increase in volume.
- **Soft Drinks Bottle**: In soft drink bottles, water's anomalous expansion can cause the bottle to deform or burst if frozen, due to the increase in volume when water turns to ice.
-

Specific Heat Capacity

Specific heat capacity is the amount of heat energy required to raise the temperature of 1 kg of a substance by 1°C. Different substances require different amounts of heat to change their temperature. Water has a high specific heat capacity, meaning it takes a lot of heat to warm it up.

Specific Heat Capacities of Some Common Substances

- **Water**: 4.18 J/g°C
- **Iron**: 0.45 J/g°C
- **Aluminum**: 0.90 J/g°C

- Water has the highest specific heat capacity compared to other substances, making it an efficient medium for regulating temperature.

Advantage of High Specific Heat Capacity of Water

Water's high specific heat capacity means it can absorb or release a large amount of heat without significantly changing its temperature. This property helps regulate temperature in nature, such as in oceans, which buffer temperature extremes, and in the human body, maintaining a stable internal temperature.

Moderate Climate

Water's high specific heat capacity helps moderate climate by absorbing heat during the day and releasing it slowly at night. This leads to less extreme temperature changes, making coastal areas have milder winters and cooler summers compared to inland regions.

Land and Sea Breeze

Land and sea breezes occur due to the difference in how land and water heat up and cool down. During the day, land heats up faster

than water, creating a sea breeze. At night, land cools faster, creating a land breeze. These breezes help regulate the temperature of coastal areas.

Water as Cooling Agents

Water is commonly used as a cooling agent because it can absorb a large amount of heat before its temperature rises significantly. This makes it effective in cooling engines, air conditioners, and in industrial processes where temperature control is crucial.

Fomentation

Fomentation involves applying a hot compress to relieve pain or improve blood circulation. The heat from the compress helps relax muscles, increase blood flow, and reduce inflammation. Water is often used in fomentation due to its ability to retain heat for long periods.

Deriving Heat Equation (Q = msΔT)

The heat equation is derived from the relationship between heat (Q), mass (m), specific heat capacity (s), and change in temperature (ΔT). It states that the heat added to or removed from a substance is directly proportional to its mass, specific heat, and the temperature change.

Q = msΔT

Where:

- Q = Heat energy (J)
- m = Mass (kg)
- s = Specific heat capacity (J/kg°C)
- ΔT = Change in temperature (°C)

Principle of Calorimetry

The principle of calorimetry is based on the law of conservation of energy. It states that the heat lost by a hotter object is equal to the heat gained by a cooler one when they are brought into thermal contact. Calorimeters are used to measure the amount of heat exchanged during chemical reactions or physical changes.

Thermometer

an instrument used to measure temperature. It works based on the principle that the physical properties of substances, like the expansion of liquids or change in resistance, vary with temperature.

Types of Thermometers

- **Digital Thermometer**: A digital thermometer uses electronic sensors to measure temperature and displays the reading on a digital screen. It is quick and easy to use.

- **Radiation Thermometer**: A radiation thermometer measures temperature by detecting the infrared radiation emitted by an object. It is useful for measuring the temperature of objects without direct contact.

- **Calibration of a Thermometer**: Calibration ensures that a thermometer gives accurate readings. It is usually done by comparing the thermometer's reading with known reference temperatures and adjusting it to match.

Temperature Scale

A temperature scale is a system for measuring temperature. It defines fixed points and assigns values to temperatures at different conditions. The three main temperature scales are Celsius, Fahrenheit, and Kelvin.

Types of Temperature Scale

- **Celsius Scale**: The Celsius scale is based on the freezing and boiling points of water at standard atmospheric pressure. 0°C

is the freezing point, and 100°C is the boiling point of water.

- **Fahrenheit Scale**: The Fahrenheit scale is commonly used in the United States. In this scale, 32°F is the freezing point of water, and 212°F is the boiling point.

- **Kelvin Scale**: The Kelvin scale is used in scientific measurements. It starts at absolute zero (0K), the lowest possible temperature, and uses the same increments as the Celsius scale.

Lower Fix Point and Upper Fix Point

- **Lower Fix Point**: The lower fix point is the temperature at which a substance freezes or melts. For water, it is 0°C (32°F).

- **Upper Fix Point**: The upper fix point is the temperature at which a substance boils. For water, it is 100°C (212°F) at 1 atmospheric pressure.

CLASS 10
UNIT 11 ELECTRICITY
ON THE BASIS OF CDC NEPAL 2082

Wave and Light

Wave: A wave is a disturbance that transfers energy from one place to another without the transfer of matter.
Example: Sound wave, light wave, water wave.

Light: Light is a form of energy that helps us to see objects.
Example: Sunlight, light from a bulb.

Refraction of Light (Short Definition)

Refraction of light is the bending of light when it passes from one medium to another medium of different density.

Terms Used in Refraction of Light

- **Angle of Incidence**: The angle between the incident ray and the normal.
- **Rarer Medium**: The medium in which light travels faster.

- **Denser Medium**: The medium in which light travels slower.
- **Angle of Refraction**: The angle between the refracted ray and the normal.
- **Normal**: The imaginary line drawn at 90° to the surface where light enters.
- **Incident Ray**: The ray of light that falls on the surface.
- **Emergent Ray**: The ray that comes out after refraction.
- **Refracted Ray**: The ray that bends inside the new medium.

Laws of Refraction of Light

1. The incident ray, refracted ray, and the normal all lie on the same plane.
2. The ratio of sine of angle of incidence to the sine of angle of refraction is constant.
(This constant is called refractive index.)

Causes of Refraction (Short Points)

- Change in speed of light
- Change in density of the medium
-

Real and Apparent Depth

Real Depth: The actual depth of an object under a surface (like water).

Apparent Depth: The depth that appears to us due to refraction. It looks less than the real depth.

Total Internal Reflection

When light travels from a denser medium to a rarer medium and the angle of incidence is greater than the critical angle, the light reflects completely inside the denser medium. This is called total internal reflection.

Critical Angle

The angle of incidence in the denser medium at which the angle of refraction becomes 90° is called the critical angle.

Illustrations of Total Internal Reflection .

Mirage: In a hot desert, the air near the ground is hotter and rarer. Light from the sky bends due to refraction and then totally reflects, making it look like water is on the ground. This illusion is called a mirage.

Totally Reflected Prisms: These are glass prisms used in optical devices like binoculars to reflect light using total internal reflection, instead of mirrors, which can lose some light.

Sparking of Diamond: Diamonds sparkle brightly because they have a very small critical angle. Light inside reflects many times before coming out, making it look very shiny.

Endoscopy: In this medical test, a flexible light pipe is inserted into the body. Total internal reflection in the pipe helps the light reach inside and carry the image back.

Light Pipe (Optical Fibre): It is a thin wire of glass or plastic. Light travels inside it by total internal reflection, even when the pipe bends. It is used in internet, communication, and medical fields.

Dispersion of Light: When white light passes through a glass prism, it splits into seven colors. This process is called dispersion. It happens because each color bends differently.

Process of Dispersion

White light is made of 7 colors. When it passes through a prism, each color bends at a different angle due to different wavelengths. This separates the light into a rainbow of colors.

Lens

A lens is a transparent object that bends light rays and forms images.

Types of Lens and Definitions

- **Convex Lens:** It is thick in the middle and thin at the edges. It converges (joins) light rays.

- **Concave Lens**: It is thin in the middle and thick at the edges. It diverges (spreads out) light rays.

Difference Between Convex and Concave Lens

Convex Lens	Concave Lens
Thick in the middle	Thin in the middle
Joins light rays	Spreads light rays
Forms real or virtual image	Forms only virtual image
Used in magnifying glass	Used in spectacles for myopia

Terminologies Used in Lenses

- **Principal Axis:** The straight line that passes through the center of the lens.
- **Principal Focus**: The point where light rays meet after refraction.
- **Radius of Curvature**: The radius of the curved surface of the lens.

- **Center of Curvature**: The center of the sphere from which the lens surface is taken.

- **Optical Centre**: The center point of the lens.

- **Focal Length: The distance between optical center and principal focus.**

Lens as Group of Prisms

A convex lens can be thought of as a group of prisms placed base to base. Light bends and meets at one point. In a concave lens, prisms are placed apex to apex, so light spreads out.

Image Formed by Convex Lens

Object Position	Image Position	Size	Nature
At very long distance (infinity)	At focus (F)	Small	Real and inverted
Beyond 2F	Between F and 2F	Smaller	Real and inverted
At 2F	At 2F	Same size	Real and inverted

Between F and 2F	Beyond 2F	Bigger	Real and inverted
At F	At infinity	Very big	Real and inverted
Between F and optical center	Behind the lens	Bigger	Virtual and erect

Focusing

Focusing is adjusting the lens to form a clear image on the screen or retina.

4 Uses of Convex Lens (Short Points)

- Used in magnifying glass
- Used in camera
- Used in microscope
- Used in correcting hypermetropia

Image Formed by Convex Lens

Object at infinity: Image forms at focus, small, real and inverted.

Object between infinity and optical centre: Image forms behind lens, large, virtual and erect.

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4 Uses of Concave Lens

- Used in spectacles for myopia
- Used in peep holes of doors
- Used in laser devices
- Used in flashlight beam

Difference Between Real and Virtual Image

Real Image	Virtual Image
Can be seen on screen	Cannot be seen on screen
Formed by actual meeting of rays	Formed by extension of rays
Inverted	Erect
Found in convex lens (except one case)	Found in concave lens

Lens Formula

Formula:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Where,

f = focal length, v = image distance, u = object distance

Magnification

Definition: It is the ratio of height of image to height of object.

Formula:

$$M = \frac{h_i}{h_o} = \frac{v}{u}$$

Power of Lens

Definition: It shows how strongly a lens bends light.

Formula:

$$P = \frac{100}{f(\text{in cm})}$$

SI Unit: Dioptre (D)

Human Eye and Its Parts

- **Cornea**: Transparent front part of the eye that bends light

entering the eye.

- **Sclera**: White outer covering of the eyeball that gives it shape and protection.

- **Choroid**: Middle layer with blood vessels that provides nutrients to the eye.

- **Ciliary Body**: Muscles that hold the lens and help in changing its shape.

- **Iris**: Colored part of the eye that controls the size of pupil and light entry.

- **Lens**: Transparent and flexible structure that focuses light onto the retina.

- **Retina**: Light-sensitive layer at the back of the eye that forms images.

- **Optical Nerve**: Carries signals from retina to brain for vision.

- **Blind Spot**: Part of retina with no light-sensitive cells; no

image is formed here.

Accommodation of Human Eye

The ability of the eye lens to change its shape to focus on near and far objects.

Normal Vision

A person with normal vision can see clearly from 25 cm to infinity.

Focusing of Eye

The eye focuses light on the retina by changing the shape of the lens.

Defects of Vision

- **Short Sightedness (Myopia)**: Can see near objects clearly but not far ones. Fixed by concave lens.
- **Long Sightedness (Hypermetropia)**: Can see far objects clearly but not near ones. Fixed by convex lens.

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Difference Between Myopia and Hypermetropia

Myopia	Hypermetropia
Near objects clear	Far objects clear
Eye is too long	Eye is too short
Fixed by concave lens	Fixed by convex lens

Defect Due to Infection in Cornea

Infections in the cornea can blur vision. If serious, it may cause blindness.

Corneal Transplantation

Replacing the damaged cornea with a healthy one from a donor.

Colour Blindness

It is the inability to see some colors properly, usually red or green.

4 Causes of Blindness (Short Points)

- Eye injury

- Vitamin A deficiency
- Infection
- Cataract

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4 Symptoms of Colour Blindness

- Difficulty in telling red and green
- Mixing up colors
- Poor color brightness
- Trouble in color-based tasks

Diagnosis of Colour Blindness

- Screening Test: Using color pattern books (like Ishihara test).
- Cataract: Cloudy lens that causes blurred vision.
- Night Blindness: Difficulty seeing in low light due to vitamin A deficiency.

Contact Lens

Contact Lens: Thin lens worn directly on the eye surface to correct vision.

- **Hard Contact Lens**: Made of rigid plastic, long-lasting.

- **Soft Contact Lens**: Comfortable, made of soft material, allows oxygen flow.

- **Extended Wear Lens**: Can be worn overnight or for many days without removal.

Laser Eye Surgery

- **LASIK**: Removes corneal tissue to correct vision.
- **SMILE**: Small cut made inside cornea to reshape it.
- **Surface Laser Treatment**: Surface layer removed and reshaped using laser.

CLASS 10
UNIT 11 ELECTRICITY
ON THE BASIS OF CDC NEPAL 2082

Current and Electricity

Current: The continuous flow of electric charge in a closed circuit is called current. It is measured in amperes (A).

Electricity: Electricity refers to the flow of electrons through a conductor.

Alternating Current

Alternating current (AC) is an electric current whose direction and magnitude change periodically. For example, alternating current is commonly used in household electric circuits.

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4 Advantages of Direct Current (DC)

1. **Direct Current (DC)** is stable and continuous.
2. It is easy to organize and control.

3. It is simple to combine and store (used in batteries).
4. Direct current is important in electronic devices.

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4 Disadvantages of Direct Current (DC)

1. It is difficult to use over long distances.
2. Requires thick wires for transmission.
3. Expensive transformers are needed for transmission.
4. Maintenance and safety are more expensive.

Direct Current (DC)

Direct current refers to the flow of electricity in a fixed direction with constant magnitude. It is typically found in batteries.

Difference Between AC and DC

Alternating Current (AC)	Direct Current (DC)
Direction and magnitude are variable	Direction is constant
Easy to transmit over long distances	Difficult for long-distance transmission
Electrical oscillation occurs	Constant and simple flow

Generator and circuit design is simpler	Requires more control in circuits like batteries

Magnetic Effect of Current

When an electric current flows through a conductor, it produces a magnetic field around it.

Nature of Magnetic Field Due to a Straight Conductor

When current flows through a straight conductor, a circular magnetic field is generated around the wire. This magnetic field is uniform and forms concentric circles.

Right Hand Grip Rule

If you hold a conductor with your right hand and point your thumb in the direction of the current, your fingers will curl in the direction of the magnetic field.

Maxwell's Corkscrew Rule

If you rotate a corkscrew in the direction of the current, your

fingers will show the direction of the magnetic field.

Solenoid and its Magnetic Field

A solenoid is a coil of wire that generates a strong, uniform magnetic field when current flows through it. The magnetic field is similar to that of a bar magnet.

Number of Turns of Insulated Wire in the Solenoid

The strength of the magnetic field in a solenoid increases with the number of turns of insulated wire. More turns lead to a stronger magnetic field.

Strength of the Current

The strength of the magnetic field depends on the strength of the electric current and the number of turns of the wire.

Inserting an Iron Core

Placing an iron core inside a solenoid strengthens its magnetic field. The iron core becomes magnetized, enhancing the magnetic

effect.

Electromagnetic Devices and Their Uses

Electromagnet: A magnet created by the flow of electric current through a coil of wire. It can be turned on or off.

Electromagnetic Bell: A device that uses an electromagnet to produce sound by vibrating a bell.

Fuse: A safety device used to stop excessive current flow by breaking the circuit.

Short-Circuiting: When an electrical circuit is unintentionally bypassed, creating a low-resistance path.

Overloading: When too much current flows through a circuit, leading to overheating.

Fuse Rating: The maximum current a fuse can carry before it blows.

Capacity of Fuse: The maximum power a fuse can handle without blowing.

Magnetic Flux

Magnetic flux refers to the quantity of magnetic field passing through a given area. It is measured in Webers (Wb).

Motor Effects and a Simple Direct Current Motor

The motor effect occurs when an electric current in a conductor experiences a force due to a magnetic field. In a simple DC motor, the force causes rotation.

Difference Between Generator and Motor

A generator converts mechanical energy into electrical energy, whereas a motor converts electrical energy into mechanical energy.

Electromagnetic Induction

Electromagnetic induction is the process of generating an electric current by changing the magnetic field around a conductor.

Faraday's Law of Electromagnetic Induction

This law states that the rate of change of the magnetic field is

directly proportional to the induced voltage in a conductor.

Fleming's Right-Hand Rule

This rule helps determine the direction of induced current when a conductor moves through a magnetic field.

Bicycle Dynamo

A bicycle dynamo is a generator that converts mechanical energy from pedaling into electrical energy to power the bike's lights.

Generator

A generator converts mechanical energy into electrical energy through electromagnetic induction.

Hydropower

Hydropower refers to the generation of electricity from the energy of flowing water.

4 Uses of Hydropower:

1. Electricity supply for homes.
2. Used in industries.
3. Agricultural irrigation.
4. Provides clean water supply.
5.

Thermal Electricity

Thermal electricity is produced by burning fuel such as coal, gas, or oil to generate electricity.

Principle of Thermal Power Station: In a thermal power station, heat from burning fuel is used to generate steam, which drives a turbine to produce electricity.

4 Advantages of Power Plants:

1. Stable electricity supply.
2. Sufficient power production.
3. Easy to implement.
4. Can be used in various locations.

4 Disadvantages of Thermal Power:

1. Pollution is produced.
2. Requires fuel resources.
3. High costs.
4. Difficult temperature regulation.

Solar Power Plant

A solar power plant uses solar panels to convert sunlight into electricity.

Wind Power (Air Electricity)

Wind power is the generation of electricity using wind energy through turbines.

4 Advantages of Wind Energy:

1. Renewable resource.
2. Pollution-free.
3. Economical.
4. Can be used in remote areas.

Transformer

A transformer is a device used to increase or decrease the voltage of an electric current.

Working Mechanism of a Transformer: A transformer changes the voltage of electrical current by using two coils: a primary coil and a

secondary coil. The voltage is increased or decreased based on the number of coils.

Types of Transformer:

1. **Step-Up Transformer**: Increases the voltage.
2. **Step-Down Transformer**: Decreases the voltage.

Eddy Current

Eddy currents are loops of electric current induced in conductors when exposed to a changing magnetic field. These currents can cause energy loss.

Difference Between Step-Up and Step-Down Transformer

Step-Up Transformer	Step-Down Transformer
Increases voltage	Decreases voltage
Low current	High current
Used for high voltage transmission	Used for low voltage supply

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CLASS 10
UNIT 12 UNIVERSE
ON THE BASIS OF CDC NEPAL 2082

Introduction to the Universe:

The universe is everything that exists: space, stars, planets, galaxies, and all forms of energy and matter. It is vast and constantly expanding. The study of the universe helps us understand the origins and the future of everything in existence. Scientists try to explore how everything came to be and how the universe functions.

Importance of Gravitation in the Universe:

Gravitation is a force that attracts objects towards each other. It holds planets, stars, and galaxies together, making it a vital force in the universe. Without gravitation, there would be no orbits for planets, stars wouldn't stay together, and the structure of the universe would be chaotic and unstable.

Origin of Universe According to Big Bang Theory:

According to the Big Bang Theory, the universe began as an extremely hot and dense point around 13.8 billion years ago. It then expanded rapidly in a massive explosion, causing the universe to cool down and form stars, galaxies, and other cosmic structures. This theory explains the origin of the universe and its continuous expansion.

Is the Universe Flat?

The question of whether the universe is flat refers to its overall shape. According to current scientific understanding, the universe appears to be flat, meaning its geometry follows the rules of Euclidean geometry. This means that parallel lines in the universe do not converge or diverge, and the angles in a triangle add up to 180 degrees.

Flat Universe and Closed Universe:

- **Flat Universe:** A flat universe means that the space is not curved, and the geometry is similar to a flat plane. In this type of universe, parallel lines stay parallel, and light travels in straight lines.

- **Closed Universe:** A closed universe has a curved space that wraps around itself, like a sphere. If you travel far enough in one direction, you would eventually return to your starting point. It could eventually stop expanding and collapse in on itself.

The Future of the Universe:

The future of the universe depends on its rate of expansion. If it keeps expanding, it could continue forever, growing colder and darker. Alternatively, the universe might eventually stop expanding and start contracting, ending in a "Big Crunch." The future of the universe is still uncertain and is the subject of ongoing research.

The Three Possible Models of the Universe:

1. **Open Universe:** An open universe expands forever and gets colder and emptier over time.
2. **Closed Universe:** A closed universe eventually stops expanding and contracts, possibly leading to a "Big Crunch."
3. **Flat Universe:** In a flat universe, expansion slows down and might reach a balance where it neither collapses nor expands forever.

A Closed Universe, Open Universe, and Flat Universe:

- **Closed Universe:** The universe is finite and eventually collapses on itself, leading to a "Big Crunch."
- **Open Universe:** The universe is infinite, expanding forever, and stars burn out over time.
- **Flat Universe:** The universe is geometrically flat, expanding forever but at a slowing rate, never collapsing.

What Things Contain the Universe:

- **Radiation:** Radiation consists of electromagnetic waves, like light, and it fills space. It provides energy to stars and galaxies.
- **Baryonic Matter:** Baryonic matter is the normal matter that makes up stars, planets, and living things. It consists of atoms and particles like protons and neutrons.
- **Dark Matter:** Dark matter is an invisible form of matter that doesn't emit or absorb light but has gravitational effects. It makes up a large portion of the universe's mass.

- **Dark Energy:** Dark energy is a mysterious force causing the universe's expansion to accelerate. It is believed to be responsible for the universe's increasing speed of expansion.

Hubble's Law:

Hubble's Law states that galaxies are moving away from us, and the farther away they are, the faster they are receding. This observation supports the idea that the universe is expanding. It also helps estimate the rate of expansion and the age of the universe.

Hubble's Law Formula and Explanation:

The formula for Hubble's Law is:
v=H0×dv = H_0 \times d

- **v** is the velocity at which a galaxy is moving away.
- $\mathbf{H_0}$ is the Hubble constant, which measures the rate of expansion of the universe.
- **d** is the distance to the galaxy.

Limitations of Hubble's Law:

Hubble's Law works well on large scales but faces limitations on smaller scales, such as within galaxies. It assumes that the universe

is homogeneous and isotropic, but there are variations in density and gravitational influences that can affect local measurements.

Hubble Constant:

The Hubble constant (H_0) represents the rate at which the universe is expanding. It's measured in kilometers per second per megaparsec (km/s/Mpc). The value of H_0 is crucial for determining the age and size of the universe.

Redshift:

Redshift occurs when light from an object moving away from us shifts towards the red end of the spectrum. This effect helps astronomers measure the velocity at which galaxies are receding from Earth and provides evidence for the expanding universe.

Interpretation of Redshift and Distance:

A higher redshift indicates a greater distance and velocity at which a galaxy is moving away from Earth. By measuring redshift, astronomers can estimate the distance to galaxies and the rate of

expansion of the universe.

Redshift Formula and Explanation:

The redshift formula is:
z=λobserved−λemittedλemittedz = \frac{\lambda_{observed} - \lambda_{emitted}}{\lambda_{emitted}}

- **z** is the redshift.
- **λ_observed** is the wavelength of light observed from the galaxy.
- **λ_emitted** is the wavelength of light emitted from the galaxy.
-

Unit Derived from Hubble Constant:

- **Hubble Time:** The time it takes for the universe to expand to its current size, given by 1H0\frac{1}{H_0}.
- **Hubble Length:** The distance at which the recession speed equals the speed of light, given by cH0\frac{c}{H_0}.
- **Hubble Volume:** The volume of space within which galaxies are moving away from us at speeds less than the speed of light, calculated by 4π3×(cH0)3\frac{4\pi}{3} \times \left(\frac{c}{H_0} \right)^3.

Age of the Universe:

The age of the universe is estimated to be approximately 13.8 billion years. This is based on the Hubble constant and

measurements of cosmic background radiation, which provide insights into the time since the Big Bang.

CLASS 10

UNIT 13 INFORMATION COMMUNICATION TECHNOLOGY

ON THE BASIS OF CDC NEPAL 2082

Digital Signal

A digital signal represents data using discrete values, typically in binary form (0s and 1s). These signals are used in digital devices like computers and smartphones and are less prone to noise and interference compared to analog signals. cite turn0search6

Bit and Byte

- **Bit**: A bit, short for "binary digit," is the smallest unit of data in a computer, representing either a 0 or a 1.

- **Byte**: A byte consists of 8 bits and is a standard unit for measuring data size, capable of representing 256 different values.

Digital Signal Transmission

Digital signal transmission involves sending data as discrete signals over various mediums like cables or airwaves. This method ensures accurate data transfer with minimal interference, making it ideal for modern communication systems.

Impact of Technology on Our Lives

- **Improved and Advanced Communication**: Technology enables instant global communication through emails, messaging apps, and video calls, connecting people across distances.
- **Advanced Business and Marketing**: Businesses utilize digital tools for online marketing, data analysis, and customer relationship management, enhancing efficiency and reach.
- **Better Housing and Lifestyles**: Smart home technologies offer automated lighting, heating, and security systems, improving comfort and convenience in daily life.
- **High-Tech Traveling and Transportation**: GPS navigation, ride-sharing apps, and electric vehicles make travel more efficient, accessible, and environmentally friendly.
- **Distance Education and Modern Learning**: Online courses and virtual classrooms provide flexible learning opportunities,

making education accessible to all.

- **Easy Accessibility to Health Care**: Telemedicine and health apps allow remote consultations and monitoring, improving healthcare accessibility and management.

- **Online Shopping and Secure Bill Payments**: E-commerce platforms and secure payment gateways enable convenient shopping experiences from home.

- **Easy Accessibility to Information**: The internet offers vast information on any topic, accessible instantly, aiding learning and decision-making.

- **Instant Connection Using Social Media**: Platforms like Facebook and Twitter allow real-time sharing of thoughts, news, and events, keeping us connected.

- **Flexibility in Work Life**: Remote working tools and flexible schedules empower individuals to balance work and personal life effectively.

- **Decreased Privacy and Increased Dependency on the Internet**: While the internet offers numerous benefits, it also poses challenges like reduced privacy and increased reliance on online services.

Netizen, Netizenship, Online Reputation, Digital Well-being

- **Netizen**: A netizen is an active and responsible member of the internet community, engaging respectfully and constructively online.
- **Netizenship**: Netizenship refers to the rights and responsibilities of individuals in the digital world, emphasizing ethical and informed online behavior.
- **Online Reputation**: Online reputation pertains to how individuals or organizations are perceived based on their digital footprints, affecting trust and credibility.
- **Digital Well-being**: Digital well-being involves maintaining a healthy relationship with technology, ensuring it enhances life without causing harm or addiction.

Preparation and Presentation of Audio-Video Materials

- **Process of Audio and Video Recording through Computer or Mobile (Mac, PC, iPhone, Android)**:

1. **Select Recording Software**: Choose appropriate software or apps compatible with your device (e.g., Audacity for PC, GarageBand for Mac, FilmoraGo for Android/iPhone).

2. **Set Up Equipment**: Connect microphones, cameras, or other recording devices, ensuring they are properly configured.

3. **Adjust Settings**: Set recording parameters like resolution, frame rate, and audio quality.
4. **Record**: Capture audio or video content, monitoring levels and quality during the process.
5. **Edit**: Use editing software to refine the recording, adding effects, transitions, or corrections as needed.
6. **Export and Share**: Save the final product in desired formats and share through appropriate channels.

How to Record Videos on PC

1. **Download Screen Recorder or Software**: Install screen recording software like OBS Studio or Camtasia.
2. **Adjust Recording Parameters**: Set the recording area, audio sources, and video quality settings.
3. **Save the Recorded Video to Your PC or Cloud Service**: After recording, save the file locally or upload it to a cloud service for storage and sharing.

Steps of Audio Editing

1. **Selection**: Choose the audio segments to edit, such as trimming unwanted parts.
2. **Editing**: Modify the selected audio by adjusting volume, removing noise, or adding effects.
3. **Processing**: Apply processes like equalization or compression to enhance audio quality.
4. **Output**: Export the edited audio to the desired format for playback or distribution.

Main Steps in Audio-Video Editing

1. **Logging**: Review and note key segments of raw footage or audio for easy access during editing.
2. **Assembling**: Organize and place selected clips in the desired sequence on the editing timeline.
3. **Creating a Rough Video**: Compile a preliminary version of the video to outline structure and flow.
4. **Making the First Cut**: Refine the rough video by trimming excess and ensuring coherence.
5. **Putting Together the Fine Cut**: Polish the video by adjusting pacing, transitions, and adding effects.
6. **Coming Up with the Final Cut**: Finalize the video with color

correction, sound mixing, and prepare it for distribution.

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CLASS 10
UNIT 14 CLASSIFICATION OF ELEMENTS
ON THE BASIS OF CDC NEPAL 2082

Classification of Elements

Elements are classified based on their atomic structure, particularly the arrangement of electrons. The classification is done into groups (vertical columns) and periods (horizontal rows) in the periodic table. The elements are grouped into metals, non-metals, and metalloids, depending on their properties. Each element has a specific place in the table, reflecting its atomic number and electron configuration.

Mendeleev's Periodic Law

Mendeleev's periodic law states that "the properties of elements are a periodic function of their atomic masses." This means that when elements are arranged in order of increasing atomic mass, their physical and chemical properties show a regular pattern.

Merits of Mendeleev's Periodic Table (Point-wise)

1. **Prediction of Missing Elements**: Mendeleev predicted the existence of elements that had not yet been discovered, like gallium and germanium.
2. **Clear Arrangement**: It arranged elements based on their atomic masses, making it easier to study their properties.
3. **Periodic Law**: It demonstrated a periodic relationship between elements' properties when arranged by atomic mass.
4. **Grouping of Elements**: Elements with similar properties were placed in the same group, which helped in understanding their behavior.

Defects of Mendeleev's Periodic Table (Point-wise)

1. **Atomic Mass Inconsistency**: Some elements didn't fit in the table based on their atomic mass (e.g., iodine and tellurium).
2. **Position of Hydrogen**: Hydrogen could not be placed in a specific group because it showed properties of both metals and non-metals.
3. **Inconsistent Atomic Masses**: Some elements had their atomic masses incorrect, which affected their position in the table.
4. **No Explanation for Isotopes**: Mendeleev's table couldn't explain the existence of isotopes, which are atoms of the same element with different atomic masses.

Law of Modern Periodic Table

The law of the modern periodic table states that “the properties of elements are a periodic function of their atomic numbers.” This means that when elements are arranged by their atomic number (not atomic mass), their properties repeat in a regular pattern.

Features of Modern Periodic Table (Point-wise)

1. **Arrangement by Atomic Number**: Elements are arranged in increasing atomic number rather than atomic mass.
2. **Periods and Groups**: The table has 7 periods (horizontal rows) and 18 groups (vertical columns).
3. **Distinct Blocks**: Elements are divided into s, p, d, and f blocks based on their electron configuration.
4. **Periodic Properties**: The properties of elements show periodicity across periods and groups.

Defects of Modern Periodic Table

1. **Position of Hydrogen**: Hydrogen is still difficult to place due to its similarities to both metals and non-metals.
2. **No Explanation for Anomalies**: Some anomalies in the periodic arrangement, like transition elements, are not fully explained.

3. **Lanthanides and Actinides**: These are placed separately at the bottom, but their placement in the table could be more logical.
4. **Chemical Behavior Unexplained**: Some elements have similar properties but are placed in different groups, which causes confusion in their chemical behavior.

Difference Between Mendeleev's and Modern Periodic Table

1. **Atomic Mass vs Atomic Number**: Mendeleev's table was based on atomic mass, while the modern table is based on atomic number.
2. **Group and Period Classification**: Mendeleev had gaps for undiscovered elements, whereas the modern table is arranged by atomic number.
3. **Isotopes**: The modern periodic table explains isotopes, while Mendeleev's table did not.
4. **Hydrogen Position**: Mendeleev could not place hydrogen, but modern periodic table places it in group 1.

Classification of Elements in Periodic Table

The periodic table classifies elements into metals, non-metals, and metalloids based on their physical and chemical properties. Metals are good conductors of heat and electricity, non-metals are poor conductors, and metalloids have properties of both. The elements

are further classified into s, p, d, and f blocks based on their electron configurations.

Chemical Reactivity Characteristics of Group

- **Valency**: The valency of elements in a group remains the same. For example, elements in group 1 (alkali metals) have a valency of 1.
- **Electronegativity**: Electronegativity increases as you move across a period and decreases as you move down a group.
- **Electropositivity**: Electropositivity increases as you move down a group and decreases across a period.
- **Chemical Reactivity in Group**: As you move down a group, the reactivity of metals increases because they tend to lose electrons more easily.

Characteristics of Periods

- **Valence Electrons**: The number of valence electrons increases as you move across a period from left to right.
- **Change in Valency**: The valency of elements increases from 1 to 4 and then decreases as you move from left to right across a period.
- **Electropositivity**: Electropositivity decreases across a period and increases down a group.

- **Electronegativity**: Electronegativity increases across a period and decreases down a group.

S, P, D, F Elements

- **S-block Elements**: These elements have their outermost electrons in the s-orbital. They are highly reactive metals, including alkali metals (group 1) and alkaline earth metals (group 2).

- **P-block Elements**: These elements have their outermost electrons in the p-orbital. They include non-metals, metalloids, and some metals, such as halogens and noble gases.

- **D-block Elements**: These elements are transition metals, and their outermost electrons are in the d-orbital. They are less reactive and include elements like iron, copper, and gold.

- **F-block Elements**: These elements are also known as inner transition metals, including lanthanides and actinides. Their outermost electrons are in the f-orbital.

Aufbau Principle

The Aufbau principle states that electrons fill atomic orbitals in order of increasing energy. This means that electrons first fill the orbitals closest to the nucleus, starting with the lowest energy level. The order of filling is based on the atomic number and the energy levels of the orbitals. This principle helps determine the electron configuration of elements.

CLASS 10

UNIT 15 CHEMICAL REACTION

ON THE BASIS OF CDC NEPAL 2082

Chemical Reaction and Its Explanation:

A **chemical reaction** is a process in which one or more substances, known as reactants, are transformed into new substances, called products. This occurs when chemical bonds are broken and new bonds are formed between atoms, resulting in a change in the substance's properties.

Types of Chemical Reactions:

1. **Combination Reaction**:
   - In a combination reaction, two or more reactants combine to form a single product.
   - Example:
     A+B→AB\text{A} + \text{B} \rightarrow \text{AB}
     2H2+O2→2H2O\text{2H}_2 + \text{O}_2 \rightarrow \text{2H}_2O

2. **Decomposition Reaction**:
   - In a decomposition reaction, a single reactant breaks down into two or more simpler products.
   - Example:
     $AB \rightarrow A + B$
     $2H_2O_2 \rightarrow 2H_2O + O_2$

3. **Displacement or Replacement Reactions**:
   - In this reaction, an element or ion in a compound is replaced by another element.

   - **Single Displacement Reaction**: One element replaces another in a compound.
     - Example:
       $A + BC \rightarrow AC + B$
       $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

   - **Double Displacement Reaction**: Two compounds exchange their ions to form two new compounds.
     - Example:
       $AB + CD \rightarrow AD + CB$

NaCl+AgNO3→NaNO3+AgCl\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}

4. **Acid-Base or Neutralization Reaction**:
   - In this reaction, an acid reacts with a base to form water and salt.
   - Example:
     HCl+NaOH→NaCl+H2O\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}

Conditions for Chemical Reactions:

1. **Heat**:
   - Many reactions need heat to break bonds and allow new bonds to form. For example, combustion reactions need heat to start.
   -
2. **Electricity**:
   - Some reactions require electricity to break compounds into ions, like in electrolysis.
3. **Light**:
   - Some reactions require light to start. For example,

photosynthesis in plants requires light energy.

4. **Contact**:
   - Reactions occur when reactants come in contact with each other, like when a metal reacts with air.

5. **Solution**:
   - Reactions occur faster in solutions because particles are more spread out, allowing them to collide more easily.

6. **Pressure**:
   - Increasing pressure can speed up reactions involving gases because it causes molecules to collide more often.

7. **Catalyst**:
   - A catalyst is a substance that speeds up a reaction without being consumed in the process.

Types of Catalysts:

1. **Positive Catalysts**:
   - Positive catalysts speed up chemical reactions.
   - Example: In the formation of ammonia, iron acts as a catalyst: N2+3H2→Fe2NH3\text{N}_2 + \text{3H}_2 \xrightarrow{\text{Fe}} \text{2NH}_3

2. **Negative Catalysts**:
    - Negative catalysts slow down chemical reactions.
    - Example: In the decomposition of hydrogen peroxide, substances like lead dioxide can act as a negative catalyst.

Characteristics of Catalysts:

1. They speed up or slow down reactions without being consumed.
2. Catalysts provide an alternative reaction pathway with lower activation energy.
3. A small amount of catalyst is enough to catalyze a large amount of reactants.

Exothermic and Endothermic Reactions:

1. **Exothermic Reaction**:
    - In an exothermic reaction, energy (usually heat) is released to the surroundings.
    - Example: $CH4+2O2→CO2+2H2O+Energy\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2O + \text{Energy}$

2. **Endothermic Reaction**:

- In an endothermic reaction, energy (usually heat) is absorbed from the surroundings.
- Example:
  CaCO3+Heat→CaO+CO2\text{CaCO}_3 + \text{Heat} \rightarrow \text{CaO} + \text{CO}_2

Limitations of Chemical Reactions:

1. Some reactions take too long to complete.
2. Reactions may require specific conditions like high temperature or pressure.
3. Not all reactions are reversible.
4. Reactions may produce unwanted by-products.

Information Obtained from Balanced Chemical Equations:

1. The number of atoms of each element in the reactants and products.
2. The mole ratio of reactants and products.
3. The conservation of mass in the reaction.
4. The type of reaction that occurred.

Rate of Chemical Reactions:

The **rate of a chemical reaction** refers to how fast the reactants are

converted into products.

Factors Affecting the Rate of Chemical Reaction:

1. **Temperature**:
   - Higher temperatures increase the rate of reaction because particles move faster and collide more often.

2. **Pressure**:
   - Increased pressure, especially in reactions involving gases, increases the rate because the particles are compressed and collide more frequently.

3. **Surface Area**:
   - More surface area allows more collisions between reactant particles, increasing the reaction rate.

4. **Physical State of Reactants**:
   - Reactants in the same physical state (solid, liquid, or gas) react faster when in the same phase.

5. **Concentration of Reactants**:
   - Higher concentration means more reactant particles in a given volume, leading to more collisions and a faster reaction.

CLASS 10
UNIT 16 SOME GASEOUS
ON THE BASIS OF CDC NEPAL 2082

Carbon Dioxide (CO_2)

Molecular Formula: CO_2
Molecular Weight: 44 (C = 12, O = 16 × 2 = 32, Total = 44)

4 Sources of Carbon Dioxide:

1. Respiration of humans and animals
2. Burning of fuels like coal and petrol
3. Fermentation of food items
4. Volcanoes and hot springs

Laboratory Preparation of Carbon Dioxide

Principle and Reaction:

Dilute hydrochloric acid reacts with calcium carbonate (like marble chips) to form carbon dioxide gas.

Reaction:

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2\uparrow$

Procedure

Take marble chips in a flask and add dilute HCl using a thistle funnel. CO_2 gas is formed and collected through a delivery tube into a gas jar by downward displacement of air, as CO_2 is heavier than air.

Manufacture of Carbon Dioxide in Industry

Industrially, carbon dioxide is made by heating limestone (calcium carbonate) in a furnace.

Reaction:

$CaCO_3 \rightarrow CaO + CO_2\uparrow$

The gas is then cooled and compressed in cylinders for use.

Test of Carbon Dioxide (Short):

When passed through lime water, it turns the lime water milky.

Reaction:

$CO_2 + Ca(OH)_2 \rightarrow CaCO_3\downarrow + H_2O$

4 Physical Properties of CO_2 (Short):

1. Colorless gas
2. Odorless
3. Heavier than air
4. Slightly soluble in water

4 Chemical Properties of CO_2 (Short) with Reactions:

1. Turns lime water milky – $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$
2. Forms weak acid with water – $CO_2 + H_2O \rightarrow H_2CO_3$
3. Does not support burning
4. Reacts with metal oxides to form carbonates

4 Uses of CO_2 (Short):

1. In fire extinguishers
2. To make soft drinks fizzy
3. For photosynthesis in plants
4. As dry ice for cooling

Ammonia (NH_3)

Molecular Formula: NH_3
Molecular Weight: 17 (N = 14, H = 1 × 3 = 3, Total = 17)

4 Sources of Ammonia:

1. Decomposition of animal and plant matter
2. Decay of urea in urine
3. From nitrogenous fertilizers
4. Industrial production (Haber process)

Laboratory Preparation of Ammonia

Principle and Reaction:

Ammonia is prepared by heating ammonium chloride with slaked lime.
Reaction:
$2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2NH_3\uparrow + 2H_2O$

Procedure

Mix ammonium chloride and slaked lime and heat them in a flask. Ammonia gas is released. It is passed through a drying agent (like quicklime) and collected by downward displacement of air as it is lighter than air.

Manufacture of Ammonia in Industry

Ammonia is made using the Haber process by combining nitrogen (from air) and hydrogen (from natural gas) under high pressure and temperature in presence of an iron catalyst.

Reaction:

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

Test of Ammonia (Short):

Ammonia has a strong, sharp smell. It turns red litmus paper blue, showing it is a basic gas.

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4 Physical Properties of NH_3 (Short):

1. Colorless gas
2. Strong, pungent smell
3. Lighter than air
4. Highly soluble in water

4 Chemical Properties of NH_3 (Short) with Reactions:

1. Turns red litmus blue – basic in nature
2. Combines with HCl to form salt – **$NH_3 + HCl \rightarrow NH_4Cl$**
3. Reacts with oxygen to form nitrogen and water – **$4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$**
4. Reacts with acids to form ammonium salts

4 Uses of NH_3 (Short):

1. In fertilizers (like urea)
2. In making nitric acid
3. As a cleaning agent
4. In refrigeration systems

Greenhouse Gases – Definition with Examples

Gases that trap heat in the Earth's atmosphere and increase temperature are called greenhouse gases.
Examples: Carbon dioxide, methane, nitrous oxide, water vapor.

Greenhouse Effect – Definition

The process by which greenhouse gases trap heat from the sun and warm the Earth's surface is called the greenhouse effect.

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4 Causes of Greenhouse Effect (Short):

1. Burning of fossil fuels
2. Deforestation
3. Industrial emissions
4. Increased agriculture (especially cattle farming)

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4 Effects of Greenhouse Effect (Short):

1. Global warming
2. Melting of polar ice
3. Rise in sea level
4. Change in weather patterns

Acid Rain – Definition with Chemical Reactions

Rainwater that becomes acidic due to mixing of gases like SO_2 and NO_2 in the atmosphere is called acid rain.

Reactions:

$SO_2 + H_2O \rightarrow H_2SO_3$

$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$

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4 Causes of Acid Rain (Short):

1. Burning of coal and oil
2. Emission from factories
3. Vehicle smoke
4. Volcanic eruptions

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4 Effects of Acid Rain (Short):

1. Damages plants and trees
2. Pollutes water sources
3. Damages buildings and monuments
4. Harms aquatic life

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4 Measures to Reduce Acid Rain (Short):

1. Use clean energy (solar, wind)
2. Reduce fossil fuel use
3. Use filters in factories
4. Plant more trees

CLASS 10
UNIT 17 METALS AND NON METALS
ON THE BASIS OF CDC NEPAL 2082

Metals and Their Properties

Definition of Metals:

Metals are elements that are usually hard, shiny, and good conductors of heat and electricity. Most metals are solid at room temperature (except mercury).

Physical Properties of Metals:

1. Metals are good conductors of heat and electricity.
2. They are shiny (lustrous).
3. They can be hammered into thin sheets (malleable).
4. They can be drawn into wires (ductile).
5. They have high melting and boiling points.
6. They are sonorous (make ringing sound when hit).

Iron (Fe)

- **Symbol:** Fe
- **Atomic number:** 26
- **Atomic weight:** 55.85
- **Valency:** 2 and 3

Position in Periodic Table:

- Group: 8
- Period: 4
- Block: d-block
- Category: Transition metal

Ores of Iron:

1. Hematite (Fe_2O_3)
2. Magnetite (Fe_3O_4)
3. Limonite ($Fe_2O_3 \cdot 3H_2O$)
4. Siderite ($FeCO_3$)

4 Physical Properties of Iron:

1. Hard and strong
2. Magnetic in nature
3. Greyish in color
4. Conducts heat and electricity

4 Uses of Iron:

1. Making tools and machinery
2. Construction of buildings and bridges
3. Manufacturing vehicles
4. Making steel

Rusting of Iron:

- When iron reacts with oxygen and moisture (water), it forms a reddish-brown layer called rust.
  Chemical Reaction:
  4Fe+3O2+6H2O→4Fe(OH)34Fe + 3O_2 + 6H_2O \rightarrow 4Fe(OH)_3
  (This later forms $Fe_2O_3 \cdot xH_2O$, called rust)

Aluminium (Al)

- **Symbol:** Al
- **Atomic number:** 13
- **Atomic weight:** 26.98

- **Valency:** 3

Position in Periodic Table:

- Group: 13
- Period: 3
- Block: p-block
- Category: Metal

Ores of Aluminium:

1. Bauxite ($Al_2O_3 \cdot 2H_2O$)
2. Cryolite (Na_3AlF_6)
3. Corundum (Al_2O_3)

4 Physical Properties of Aluminium:

1. Light in weight
2. Silvery-white in color
3. Good conductor of electricity
4. Does not rust easily

4 Uses of Aluminium:

1. Making airplanes and vehicles
2. Cooking utensils
3. Electric wires
4. Window frames

Copper (Cu)

- **Symbol:** Cu
- **Atomic number:** 29
- **Atomic weight:** 63.55
- **Valency:** 1 and 2

Position in Periodic Table:

- Group: 11
- Period: 4
- Block: d-block
- Category: Transition metal

Ores of Copper:

1. Copper pyrite ($CuFeS_2$)
2. Malachite ($CuCO_3 \cdot Cu(OH)_2$)
3. Cuprite (Cu_2O)

4 Physical Properties of Copper:

1. Reddish-brown in color
2. Excellent conductor of electricity
3. Malleable and ductile
4. Heavy and strong

4 Uses of Copper:

1. Electrical wires
2. Coins
3. Plumbing pipes
4. Cooking utensils

Silver (Ag)

- **Symbol:** Ag
- **Atomic number:** 47
- **Atomic weight:** 107.87
- **Valency:** 1

Position in Periodic Table:

- Group: 11
- Period: 5
- Block: d-block
- Category: Transition metal

Ores of Silver:

1. Argentite (Ag_2S)
2. Horn silver (AgCl)
3. Native silver

4 Physical Properties of Silver:

1. Shiny white and soft
2. Best conductor of electricity
3. Malleable and ductile
4. Not reactive easily

4 Uses of Silver:

1. Making jewelry and ornaments
2. Making coins
3. Silver coating on mirrors
4. Used in photography

Gold (Au)

- **Symbol:** Au
- **Atomic number:** 79
- **Atomic weight:** 196.97
- **Valency:** 1 and 3

Position in Periodic Table:

- Group: 11
- Period: 6
- Block: d-block

- Category: Transition metal

Ores of Gold:

1. Native gold
2. Calaverite ($AuTe_2$)
3. Sylvanite

4 Physical Properties of Gold:

1. Yellow and shiny
2. Soft and malleable
3. Does not rust
4. Good conductor of electricity

4 Uses of Gold:

1. Jewelry and ornaments
2. Coins and medals
3. Coating in electronic devices
4. Decoration and investment

Simple Methods of Extraction of Metal

Metallurgy:

The process of extracting pure metal from its ores is called metallurgy.

Types of Metallurgy:

1. **Pyrometallurgy:**
   Extraction of metal using heat.
   Example: Iron from hematite.
2. **Electrometallurgy:**
   Extraction using electricity.
   Example: Aluminium from bauxite.
3. **Hydrometallurgy:**
   Extraction using chemical solution.
   Example: Gold from its ore using cyanide.

Mining:

The process of digging or taking out ores from the earth is called mining.

Preliminary Treatments (First steps before extraction):

1. **Crushing and Pulverization:**
   Large pieces of ore are broken into small pieces or powder.
2. **Concentration or Ore Dressing:**
   The unwanted materials (gangue) are removed from the ore.
3. **Handpicking:**
   Picking out the unwanted pieces by hand.

Methods for Concentration of Ores:

1. **Gravity Separation (Levigation):**
   Heavier ore particles are separated from lighter impurities by water flow.
2. **Froth Flotation:**
   Used for sulphide ores. Ore particles stick to froth and float on water, impurities sink.
3. **Magnetic Separation:**
   Magnetic ores are separated from non-magnetic impurities using a magnet.
4. **Leaching (Chemical Method):**
   Ore is dissolved in a chemical solution, then pure metal is recovered from it.

Calcination and Roasting:

1. **Calcination:**
   Heating ore in limited air to remove moisture or volatile substances.
   Example: $CaCO_3 \rightarrow CaO + CO_2$
2. **Roasting:**
   Heating ore in excess air to convert sulphide ores into oxide.
   Example: $ZnS + O_2 \rightarrow ZnO + SO_2$

Reduction: (Removing oxygen to get metal)

1. **Reduction by Heat:**
   Heating the ore to high temperature.
   Example: $HgO \rightarrow Hg + O_2$

2. **Chemical Reduction:**
   Using chemicals like carbon to remove oxygen.
   Example: $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO_2$

3. **Reduction by Carbon (Smelting):**
   Heating ore with coke or coal to extract metal.
   Example: Extraction of iron

4. **Reduction by Aluminium (Thermite Process):**
   Aluminium powder reduces metal oxides.

Example: $Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3$

5. **Reduction by Electrolysis:**
   Using electricity to separate metal from ore.
   Example: Aluminium from bauxite

Refining of Impure Metals:

1. **Liquation:**
   The impure metal is melted. Pure metal melts and flows away, impurities remain.

2. **Distillation:**
   Metal is heated and vaporized. Vapors are collected and cooled to get pure metal.
   Used for low boiling metals like zinc and mercury.

3. **Poling:**
   Green wood is stirred in molten metal to remove impurities by oxidation.
   Used for copper.

4. **Electrolytic Refining:**
   Impure metal is made the anode, pure metal is deposited on cathode using electricity.
   Used for copper, silver, gold, etc.

CLASS 10
UNIT 18 CARBON AND ITS COMPOUND
ON THE BASIS OF CDC NEPAL 2082

Hydrocarbon

Hydrocarbons are organic compounds made up of only **carbon (C)** and **hydrogen (H)** atoms.
They are the main part of fuels like petrol, diesel, and natural gas.

Saturated and Unsaturated Hydrocarbons

- **Saturated hydrocarbons**:

  These have **only single bonds** between carbon atoms.
  Example: Methane (CH_4), Ethane (C_2H_6)
  These are also called **alkanes**.

- **Unsaturated hydrocarbons**:
  These have **one or more double or triple bonds** between carbon atoms.

Example:

- Alkene (double bond): Ethene (C_2H_4)
- Alkyne (triple bond): Ethyne (C_2H_2)

•

Homologous Series

A **homologous series** is a group of organic compounds having the same general formula and similar chemical properties.

Examples:

- Alkane series: CH_4 (methane), C_2H_6 (ethane), C_3H_8 (propane)

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4 Characteristics of a Homologous Series

1. Same general formula
2. Same functional group
3. Difference of CH_2 group between two members
4. Similar chemical properties

Alkane, Alkene, Alkyne

Hydrocarbon	Definition	General Formula	Example	Other Name
Alkane	Saturated hydrocarbon with	CnH_2n+_2	Methane (CH_4)	Paraffin

	only single bonds			
Alkene	Unsaturated hydrocarbon with one double bond	C_nH_{2n}	Ethene (C_2H_4)	Olefin
Alkyne	Unsaturated hydrocarbon with one triple bond	C_nH_{2n-2}	Ethyne (C_2H_2)	Acetylene series

Alkyl Radical

Alkyl radical is formed by removing one hydrogen atom from an alkane.

General Formula: C_nH_{2n+1}

Examples:

- Methyl (CH_3–) from Methane (CH_4)
- Ethyl (C_2H_5–) from Ethane (C_2H_6)

Groups

Groups are atoms or group of atoms that replace hydrogen in hydrocarbons.

Examples with formula:

- Hydroxyl group (–OH) → Alcohol
- Carboxyl group (–COOH) → Organic acid

IUPAC Full Form and Explanation

IUPAC: *International Union of Pure and Applied Chemistry*
It gives standard rules for naming chemical compounds all over the world to avoid confusion.

Common System to Name Hydrocarbons

In the **common system**, hydrocarbons are named based on their source or behavior.
Example: Methane (from "marsh gas")

Word Root and Addition of Suffix

- **Word Root**: Shows the number of carbon atoms
  - Meth = 1, Eth = 2, Prop = 3, But = 4, etc.

- **Suffix**: Added according to bond type
  - Ane = single bond (alkane)
  - Ene = double bond (alkene)
  - Yne = triple bond (alkyne)

Common Hydrocarbons and Related Compounds

Compound	Formula	Source	Two Uses
Methane	CH_4	Biogas, Natural gas	Fuel, makes carbon black
Ethane	C_2H_6	Natural gas	Fuel, makes ethylene
Propane	C_3H_8	Petroleum gas	Cooking gas, fuel in industries
Butane	C_4H_{10}	LPG gas	Lighter fuel, cooking gas

Isomer of Butane

Butane has two isomers:

1. **n-Butane** (straight chain)
2. **iso-Butane** (branched chain)

Alcohol

Alcohol is an organic compound that has a hydroxyl group (–OH) attached to a carbon atom.

General Formula: CnH_2n+1OH

Examples:

- Methanol (CH_3OH)
- Ethanol (C_2H_5OH)

Types of Alcohol

1. **Monohydric Alcohol**: Has one –OH group
   - Example: Ethanol (C_2H_5OH)

2. **Dihydric Alcohol**: Has two –OH groups
   - Example: Ethylene glycol ($C_2H_4(OH)_2$)

3. **Trihydric Alcohol**: Has three –OH groups
   - Example: Glycerine ($C_3H_5(OH)_3$)

Methyl Alcohol (Methanol)

- **Formula**: CH_3OH
- **Properties**: Colorless, poisonous, soluble in water
- **Uses**:
  1. Solvent
  2. Fuel
  3. Make formalin
  4. Used in industries

Ethyl Alcohol (Ethanol)

- **Formula**: C_2H_5OH
- **Properties**: Colorless, volatile, used in drinks
- **Uses**:
    1. Alcoholic drinks
    2. Antiseptic
    3. Solvent
    4. Fuel

Ethylene Glycol

- **Formula**: $C_2H_4(OH)_2$
- **Properties**: Thick, colorless, sweet taste
- **Uses**:
    1. Antifreeze in car radiators
    2. Solvent
    3. Make polyester
    4. Brake fluid

Glycerine (Glycerol)

- **Formula**: $C_3H_5(OH)_3$
- **Properties**: Sweet, thick, colorless, soluble in water
- **Uses**:

1. Cosmetics
2. Medicine
3. Food industry
4. Explosives (to make nitroglycerine)

CLASS 10
UNIT 19 CHEMICAL USED IN DAILY LIFE
ON THE BASIS OF CDC NEPAL 2082

Introduction of the Chapter (Preservation and Chemical Safety)

This chapter teaches us how to keep food safe for a long time, how to use chemicals safely in cleaning and farming, and how to protect ourselves and the environment from harmful chemical pollution.

Preservation of Food

Preservation of food means keeping food safe from getting spoiled by stopping the growth of germs. This helps food stay fresh and last longer. People use different methods like drying, freezing, adding preservatives, and storing properly. It helps reduce food waste and keeps food safe to eat for a longer time.

4 Importance of Food Preservatives (in short points)

1. Stop the growth of harmful bacteria and fungi.
2. Increase the shelf life of food.
3. Keep the original taste, color, and smell.
4. Help in easy transport and storage of food.

Types of Preservatives

Natural Preservatives

These are found in nature and used without chemicals. Examples: Salt, sugar, vinegar, lemon juice, and turmeric. They are safe and used in homemade pickles and jams.

Artificial Preservatives

These are man-made chemicals added to food to prevent spoilage. Examples: Sodium benzoate, potassium metabisulphite. They are used in packed and processed foods.

4 Side Effects of Preservatives

1. May cause allergies or skin problems.
2. Can harm the digestive system.
3. Risk of cancer if used in large amounts.
4. May affect children's behavior and growth.

Define Cleanser

Cleansers are substances or chemicals used to clean things like clothes, dishes, floors, toilets, and skin.

Chemicals Used in Cleanser

Acidic Chemicals

Used to remove stains, rust, and toilet cleaning. Example: Hydrochloric acid.

Alkaline Chemicals

Used in soaps and detergents to remove grease and oils. Example: Sodium hydroxide.

Neutral Chemicals

Used in handwash and mild shampoos. They are gentle and don't

harm the skin. Example: Water-based cleaners.

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4 Effects of Chemical Cleanser

1. Can cause skin burns or irritation.
2. Harmful if inhaled or swallowed.
3. May damage eyes.
4. Pollute water and soil.

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4 Ways to Prevent Harm from Cleaning and Household Products

1. Read and follow label instructions.
2. Keep out of reach of children.
3. Use gloves and masks while cleaning.
4. Store chemicals in safe, closed containers.

What is Poisonous Chemicals?

Poisonous chemicals are harmful substances that can cause illness, injury, or even death when eaten, inhaled, or touched. Examples: acids, pesticides, chlorine, and insect killers.

Precaution in the Storage of Insecticides, Pesticides, Rodenticides, Acid, and Chlorine

Transportation

Use proper containers, keep away from food, and label clearly. Only trained people should carry them.

Storage

Keep in locked cupboards, away from children, pets, and food items. Store in a cool and dry place.

Container Disposal

Never reuse empty containers. Crush or puncture them and throw them in a safe place following rules.

Protection of Non-Pest Animals and Plants

Don’t spray chemicals near useful insects like bees and plants not being treated. Follow directions.

Posting Treated Field

Put signboards to warn others not to enter the treated field until it’s safe.

Pre-Harvest Interval

Wait for a certain time after spraying before harvesting crops. This keeps food safe.

Permit Requirements

Use only legal and approved chemicals. Some need special permission.

Maximum Residue Level (MRL)

MRL is the highest amount of pesticide allowed on food. Follow guidelines to avoid health risk.

Crop Injury

Using too much chemical or wrong ones can harm crops. Always use correct amounts.

Personal Safety

Wear gloves, masks, and boots. Don't eat, drink, or smoke while using chemicals. Wash hands after use.

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4 Precautions of Using Acid

1. Wear gloves and goggles while handling.
2. Do not mix with other chemicals.

3. Use only in well-ventilated areas.
4. Store in labeled, closed containers.

Precautions While Purchasing and Storing Acid

- Buy from a trusted shop.
- Check expiry date and label.
- Keep in original container.
- Store away from heat, children, and food.

Precautions of Using Chlorine

Safety Information

- Always use the correct amount.
- Avoid contact with eyes and skin.
- Don’t mix with acid or ammonia.

Pool Chemical Safety

- Add chlorine to water, not water to chlorine.
- Store in dry, cool place.
- Keep away from sunlight and children.

Chlorine Bleach Safety

- Use in open area.
- Never mix with other cleaners.
- Wear protective gear during use.

Management of Chemical Pollution

Define Chemical Pollution

Chemical pollution is the release of harmful chemicals into the air, water, and soil, which harms living beings and the environment.

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4 Causes of Chemical Pollution

1. Use of pesticides and insecticides in farming.
2. Release of smoke and waste from industries and vehicles.
3. Use of chemical fertilizers and detergents.
4. Throwing plastic and waste materials everywhere.

Following Are Reasons of Chemical Pollution

Pesticides

Used to kill insects on crops, but they pollute soil, air, and water and harm helpful insects and humans.

Chemical Fertilizer

These help plants grow but cause pollution when used too much. They mix with rivers and lakes and harm water animals.

Industrial and Vehicular Emissions

Factories and vehicles release harmful gases and chemicals that pollute air and water and cause diseases.

Detergent

Used in washing, but when mixed in water sources, they pollute and harm fish and plants.

Domestic Sewage

Wastewater from homes contains soaps, oils, and chemicals that pollute rivers and cause diseases.

Solid Waste and Plastic

Plastic and garbage don't rot. They block drains and pollute soil and water.

Metallic Particles

From batteries and machines, they mix in water and soil and harm plants, animals, and humans.

Dyes

Used in coloring clothes and food. They may contain harmful chemicals that pollute water and harm life.

Colouring Matter in Foodstuff

Artificial food colors can cause health problems and add chemical pollution when disposed.

4 Solutions to Chemical Pollution (in short points)

1. Use organic fertilizers and natural pesticides.
2. Properly manage and recycle waste.
3. Reduce the use of harmful chemicals.
4. Make strict laws and follow safety rules.