

1. Explain the concept of Solid Waste Management. Describe the different methods used for waste disposal and discuss the advantages and disadvantages of each method.

What is Solid Waste?

Solid waste refers to any material of refuse or waste generated domestically, commercially, industrially or agriculturally.

Types of Solid Wastes

Based on origin

- o municipal waste
- o Industrial waste
- o Agricultural waste
- o mining waste

Based on composition

- o Biodegradable waste
- o recyclable waste
- o inert waste
- o E-waste.

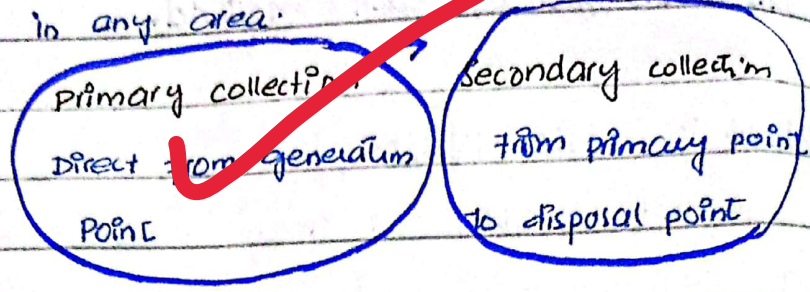
What is solid waste management?

Solid waste management refers to the generation, collection, transport, recycle, and disposal of solid waste. Solid waste management, thus has the following activities:

1. Solid Waste Generation: Solid or semi-solid

Waste is generated from various places.

2) **Waste collection:** The waste is then collected by municipal authorities in any area.



3. **Waste Transport:** After collection, the waste is transported to disposal or treatment site.

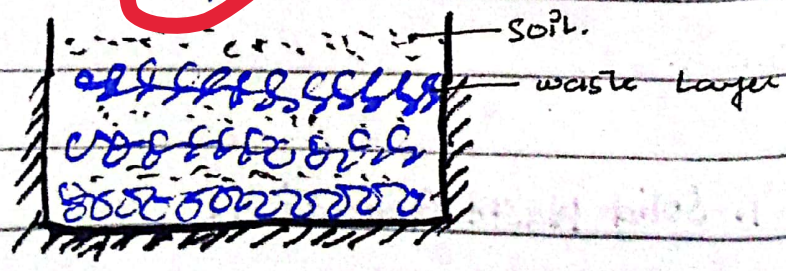
4) **Treatment & Disposal:** Based on the type, the waste is then recycled or disposed off.

Methods of Waste Disposal

The disposal of solid waste is carried off through various methods.

1. Landfill

In this method, the waste is dumped in the land and a layer of soil is added over each layer of garbage.

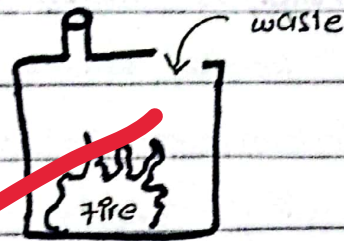


Advantage: Easy disposal

Disadvantage: Takes up large swatches of land, that becomes unfit for construction.

2) Incineration

Burning of waste in a controlled manner.



Advantage: hygienic; 90% volume reduction

Disadvantage: toxic fumes; environmental hazard

3) Composting

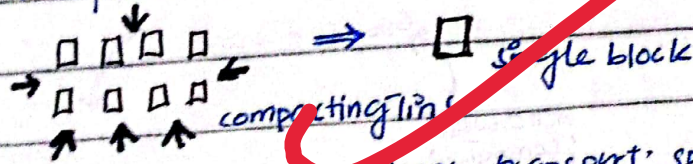
Organic wastes are left to decompose. They are then used as fertilizers.

Advantage: environmental friendly

Disadvantage: time-consuming; disease risk.

4) Waste Compaction

The wastes are compacted and then sent for recycling reducing transport space.



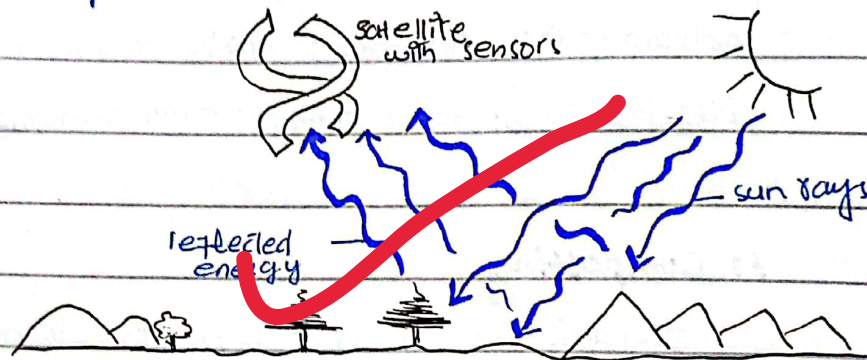
Advantage: reduces transport space

Disadvantage: costly.

2. How can remote sensing and GIS be used to monitor and analyze environmental changes? Give specific examples of their applications in environmental science.

What is meant by remote sensing?

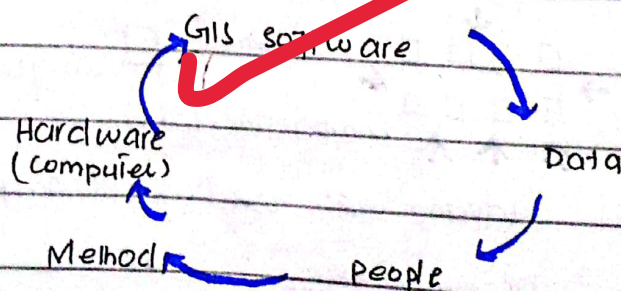
Remote sensing is the process of gathering information related to any area by using sensors.



The sensors receive the energy and the data is then processed and analyzed.

What is Geographic Information System?

As the name implies, the Geographic Information System (GIS) is a computer system that analyzes and displays geographically referenced information.



Use of Remote Sensing and GIS To Monitor and Analyze Environmental Changes

The fundamental application of remote sensing and GIS is to provide valuable data concerning land cover. Any change as a result of environmental disturbance is recorded and analyzed.

1. Land Use and Land Cover Change (LULC)

LULC refers to any landscape, whether natural or man-made. Both remote sensing and GIS help detect deforestation, urbanization, agricultural expansion or desertification.

2. Climate Change Impacts

The combined application of RS and GIS can be employed to detect sea-level rise, glacier retreat, and extreme weather events.

3. Conservation Planning

They can identify areas facing biodiversity loss and thus help in planning to conserve those biodiversity.

4. Urban Environmental Management

They can aid in UEM by tracking urban heat islands, pollution hotspots and green space dynamics.

5. Disaster Management

RS and GIS can help monitor and analyze events like floods, droughts, wildfires and earthquakes in near-real-time.

Case Studies

1) Deforestation in Amazon

Remote sensing tracks forest cover loss, while GIS analyzes socio-economic drivers.

2) Coastal Erosion in Laizhou Bay

The bay in China is eroding at an excessive speed. Remote sensors monitor the shoreline changes while GIS assesses the impacts on human settlements.

3. What are the main factors that contribute to population growth? Describe the potential environmental impacts of uncontrolled population growth.

What is population growth?

Population growth refers to demographic change in respect of increase in the number of people in an area. This is due to multiple reasons, including human migration, increased fertility, increased life expectancy, and uncontrolled birth rate.

Factors contributing to Population Growth

There are three main factors that affect population growth.

1) The Fertility Rate

The rate at which an increase in population occurs refers to the fertility rate. UN defines it as,

"The ratio of annual births to women at a given age."

The FR of Pakistan is 3.41 per woman

The FR of India is 2.01 per woman

Niger has highest with 6.6 per woman

South Korea has lowest with 0.78 per woman

Keep the descriptions brief

2. Life Expectancy

Life expectancy refers to the number of years a person is expected live based on a statistical average. Increased life expectancy increases population.

The LE of

Country	Life Expectancy (Years)
Pakistan	66.43
India	67.71
Lesotho	53 (lowest)
Hong Kong	88 (highest)

3) Net Immigration Ratio

Net immigration is the difference between immigrants (people coming to a country) and emigrants (people leaving a country/area). divided by the population. Thus,

$$NIR = \frac{\text{immigrants} - \text{emigrants}}{\text{population}}$$

Thus, a positive NIR indicates population growth.

Environmental Impacts of uncontrolled population growth - overpopulation

An uncontrolled population growth has the following environmental impacts:

1. Ecological Degradation

The environment deteriorates due to compromised quality of air, water and soil. (Example) Air pollution, ocean acidification.

2. Resource Depletion

Resource depletion occurs when excessive amounts of resources are used. These may include minerals, water and fossil fuels.

3. Habitat Disturbance

An unexpected influx of people may disturb natural habitat especially when deforestation is done to accommodate them.

4. Increased pollution

Increased population gives waste to environment more than it can dispose off.

5. Biodiversity Loss

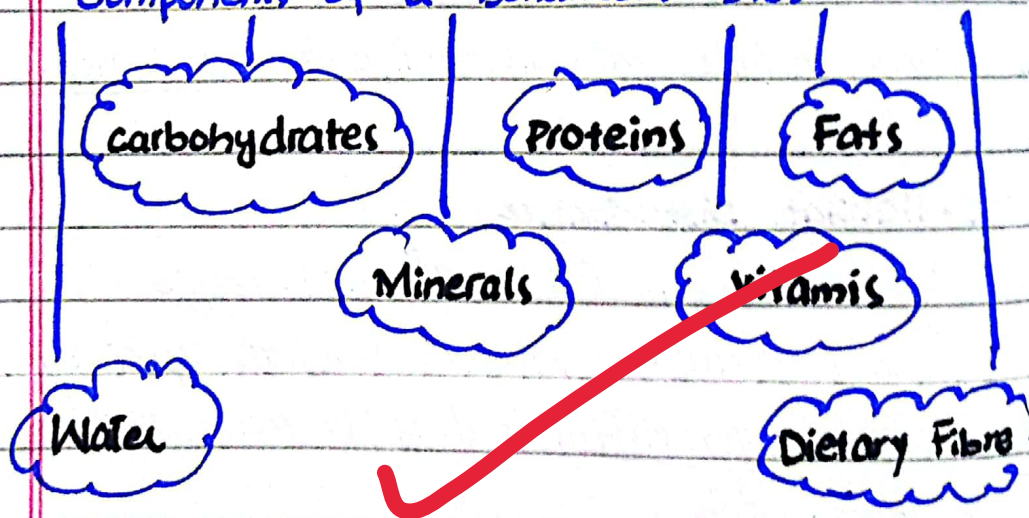
many species of fauna emigrate with overpopulation.

4. What are the essential components of a balanced diet? Briefly describe the role of each component in maintaining good health.

What is a balanced diet?

A balanced diet is the one which includes right amount of all the nutrients such as proteins, vitamins, fats, carbohydrates, and one mineral. It has a direct relation with a person's health.

Components of a Balanced Diet



1. Carbohydrates

Function:

Also called saccharides, carbohydrates are the key source of energy.

1 gram of carbohydrate has 4 calories.

Other than an instant source, the excess

is stored to give energy in between meals.

Sources:

- 1) cereals
- 2) potato
- 3) fruits, especially dates.

2. Proteins

proteins are large biomolecules comprising one or more chains of amino acids.

Functions of proteins

- i) Digestive enzymes are made of proteins
- ii) Antibodies are made of proteins, hence helps in immune system
- iii) aids in blood clotting.
- iv) provides structure - collagen, keratin, elastin

Sources:

- i) animals - fish, egg, meat, milk
- ii) plants - pulses, beans, groundnuts.

3. Fats

They are naturally occurring organic compounds made of triglyceride.

Functions:

- i) serve as energy reserve
- ii) provides insulation
- iii) Dissolves vitamins. (K, E, D, A).

Source:

- i) Seeds
- ii) vegetable oil
- iii) animal fat.

4. Vitamins

They are organic compounds required in small amounts: Vitamin, A, D, E, K, C, B complex.

Function:

Varies for each vitamin: A for vision, vitamin D for bone formation, so on.

Source:

A from carrots, D from dairy products.

5. Minerals

They are also required in small quantities

- i) calcium - Bone formation, blood clotting
- ii) magnesium - protein synthesis
- iii) potassium - Acid-base balance.

Good answers!!!

6. Dietary Fibre

They do not have a dietary nutrition but help regulate bowel movements.

Found in skins of vegetables

7. Water

Hydrate dietary components.

Attempt and upload a single qs at a time for evaluation

5. Explain the concept of 'bioavailability' of nutrients. How can food processing and preparation affect the bioavailability of nutrients?

Defining Bioavailability of Nutrients

It refers to the proportion of a nutrient consumed in a diet, that is absorbed and utilized by the body.

Absorption of nutrients involve:

1. Digestion
2. Assimilation
3. Utilization

Factors Affecting Bioavailability of Nutrients

1. Nutrient absorbability
2. Processing and cooking procedure
3. Age
4. Sex
5. Physiological health
6. Consumption of drug
7. Combination of foods eaten together

How can Bioavailability of Nutrients Be Increased

1. Optimizing gastrointestinal systems.

For example Drinking more water

2. Taking less stress

3. Addidi Adding spices

For Example Pepper increases bio-availability by 2000%.

4. Consuming probiotics increase bio-availability of calcium.

5. Adding oil to food

Example Absorption of fat-soluble vitamins (A, D, E, K).

How Food Processing Affects Bioavailability of Nutrients?

The nutrients of food is always altered by the processing of food.

1. Milling

milling refer to breakdown of food by grinding or crushing in a mill. Cereals lose their hulls at milling which contain dietary fibre and B complex.

2. Blanching

It is the quick heating of food before canning or freezing. Vitamins like A, D, E, K and C are washed off.

3. Canning

Food is heated inside the can to

kill micro-organisms which also kill
destroy water-soluble vitamins they are
temperature sensitive.

4. Pasteurization

milk and fruit juices are heated to
specific temperatures losing vitamins.

5. Dehydration

To increase shelf-life, foods are
dehydrated. This reduces vitamin, but
makes it nutrient-dense which may
contribute to weight gain.

Impacts of Food Preparation on Nutrient Bioavailability

Positive Impacts

1. Cooking → Enhanced
Absorption
2. Boiling → Reduction
of Anti-nutrients (Eg Tannins)
3. Crushing → Activation of
Beneficial nutrients
Eg: Allicin in Garlic

Negative Impacts

1. Leaching → Nutrient
Loss
2. Heating → Denaturation
of proteins and
enzymes.
3. Frying → may
produce gly-
acrylamides that
negatively affects
human health.

6. Describe the different methods of food preservation and describe how they help to prevent food deterioration.

Defining Food Preservation

Food preservation is any method by which food is kept from spoilage and food-borne illness while maintaining nutritional value, texture, and flavor.

Major Causes of Food Deterioration

Food is deteriorated due to following reasons:

1. **Biological Spoilage**

- Growth activity of bacteria, yeast, mould
- action of food enzyme
- Damage by pests, rodents

2. **Chemical Spoilage**

- Reaction with oxygen
- Reaction with other food ingredients

3. **Physical Spoilage**

- inappropriate temperature
- time
- gain/loss of moisture.

Methods of Food Preservation

There are various methods of food preservation that help to prevent food deterioration.

1. Heating

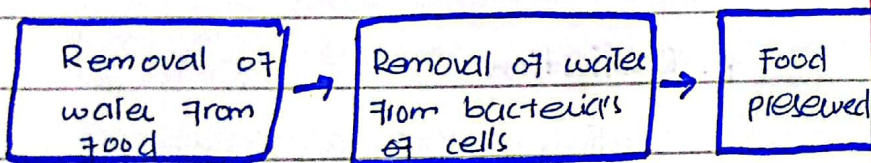
Heating food at a specific temperature kills micro-organisms and help prevent food deterioration.

Purpose	Temperature(°C)
Killing Bacteria, molds	16 - 33
Killing Thermophiles	66 - 82
Pasteurization	63
Sterility	121

2. Cold / Freezing

Below 10°C growth of microorganisms slows down and under -10°C there is no multiplication of microorganism

3. Drying



4. Addition of salt and sugar

Addition of sugar syrup or salt brine
↓
microorganisms try to maintain water concentration inside and out
↓
Dehydration of micro-organisms' cells
→ Plasmolysis
↓
microorganisms stop multiplying

5. Addition of preservatives

Preservatives prevent the growth of bacteria and fungi, thus keeping food for longer periods.

6. Use of Smoke

Smoke contains preservatives such as formaldehyde that comes from burning of wood. Moreover, the heat in smoke kills microorganisms.

7. Oxygen control

Creation of anaerobic conditions kill many aerobic microorganisms.

(For example) : wax coating, skin-tight plastic films.

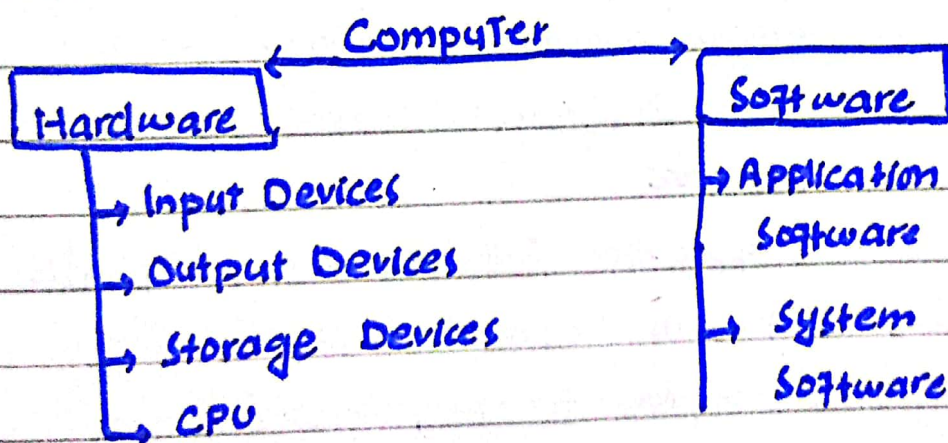
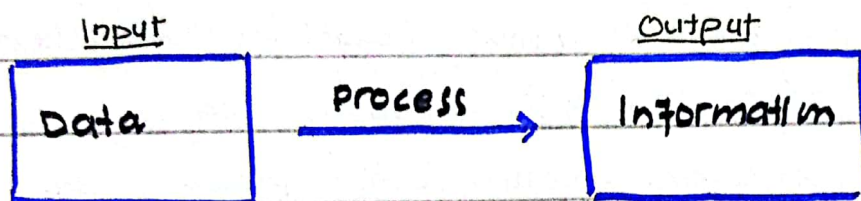
8. Radiation

Radiations such as X-rays, microwaves, UV rays and ionizing radiations inactivate enzymes responsible for vegetable sprouting. They also kill human disease-causing bacteria.

7. Compare and contrast the functions of hardware and software in a computer system. Give examples of each.

Defining Computer

A computer is an electronic machine, operating under the control of instructions stored in its own memory that process data to create information



Definition

A. Hardware

It refers to the physical part of computer.
It is used to run the software.

B. Software

It consists of the computer instructions.

Components

A. Hardware

- 1) Input Devices: permit the users to interact with the computer. For example, mouse, keyboard.
- 2) Output Devices: makes the computer result available to the users. For example, monitor, speaker.
- 3) Storage Devices: stores the data for use. For example, Read-Only memory (ROM), Random Access memory (RAM).
- 4) Central processing Unit: processes data through Arithmetic Logic Unit (ALU) and controls communication within CPU. It is called the brain of computer.

B. Software

- 1) Application Software: performs specific functions beyond basic operations of computers. For example, gaming and social media apps.
- 2) System Software: directly operates the computer hardware. For example, operating systems, utilities.

Tangibility

A. Hardware

- Hardware devices are tangible because they are physical parts.

B. Software

Softwares are intangible and do not physically exist.

Recovery

A. Hardware

They can be repaired and even replaced.

B. Software

many softwares once corrupted cannot be retrieved.

Upgrade

A. Hardware

once established, the hardware remains the same.

B. Software

Softwares can be updated and may operate if the hardware supports them.

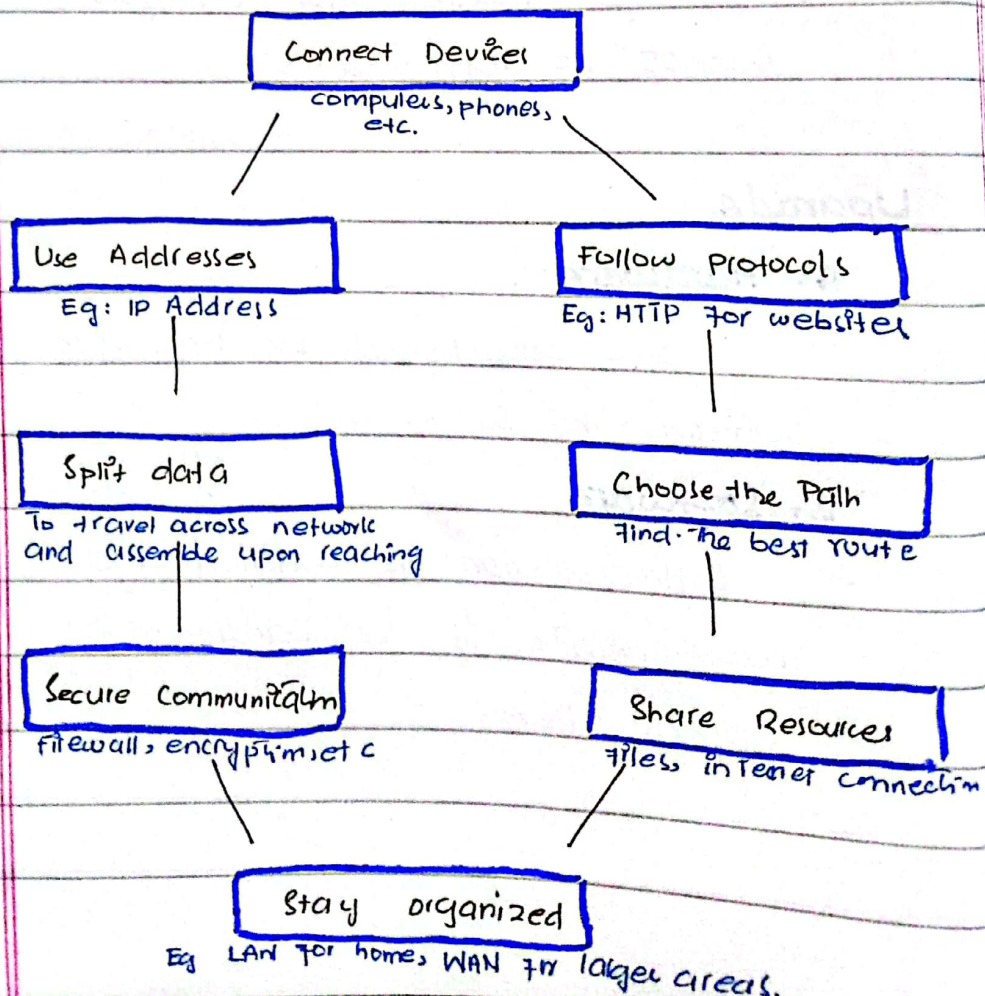
8. Explain the basic principles of networking and the role of internet standards in facilitating communication.

Defining Networking

Networking is a system consisting a group of two or more computers that intelligently share resource such as software and data devices with each other.

Basic Principles of Computer Networking

Computer networking has certain fundamental principles that form its foundation.



Types of Networks (Based on Geographical Span)

1. Local Area Network (LAN)

The network is spanned inside a building under a single administrator.

Example Office, university.

2. Metropolitan Area Network (MAN)

Spans to larger areas like a campus. It provides internet for LAN. - A city.

3. Wide Area Network (WAN)

The network may span a wider area. For example A province or even a country.

Telecommunications are WAN

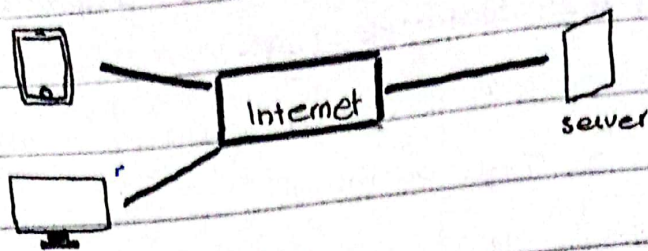
4. Internetwork (Internet)

It is the largest network and connects WANs.

Role of Internet Standards in Facilitating Communication

Internet standards enable global connectivity by establishing common protocols and formats that ensure interoperability - seamless communication of diverse networks.

Simply, it allows communication to and from devices.



Internet Engineering Task Force (IETF) has set the following internet standards:

1. Internet Protocol (IP)

They are protocols that serve as foundation in data transmission and transport data packets across the network.

2. Domain Name System (DNS)

Translates human-readable domain names eg. www.example.com into machine-readable IP addresses.

3. Hypertext Transfer Protocol (HTTP)

It is a set of rules and standards that govern how web servers and clients (web browsers) interact for data exchange. It facilitates the transfer of text, images, video, audio between clients and servers in World Wide Web.

9. Describe the different types of social media websites and discuss their potential impact on society.

What are Social Media Websites?

Social media websites are platforms of social networking that group individuals and organizations together for exchange of thoughts, interests and activities.

Different types of Social Media Websites

Broadly, social media websites can be divided into the following categories:

1. Social Networks

These websites help people connect and exchange thoughts and data.

Examples: ○ Facebook (2.96 billion users)

○ YouTube (2.51 billion users)

○ WhatsApp (2 billion users)

2. Discussion Forums

These websites encourage people to answer questions and share news.

Examples: ○ Reddit (500 million users)

○ Quora (400 million users)

3. Blogging and Publishing Networks

These social media networks give me

space to share thoughts and write-ups.

- Examples :
- o Medium (100 million users)
 - o Tumblr (400 million users)

4. Social Shopping Networks

These are websites that allow people to spot trends, share finds and make purchases.

- Examples :
- o Amazon (300 million users)
 - o Daraz (30 million users)

5. Video Hosting Platforms

They offer independent journalists, filmmakers and creators to reach an audience quickly through video.

- Examples :
- o Instagram (2 billion users)
 - o TikTok (1.65 billion users)

Impacts of Social media Websites on Society

The use of social media has both positive and negative impacts on society.

A. Positive Impacts of Social Media Use

1. It facilitates open communication and easy access to information.
2. They offer instant messaging people facilitating with real-time chat.
3. One can interact with people of

his choice and block those he dislikes.

4. One can discuss ideas and show his creativity.

5. They provide marketing opportunities through advertisements.

• Facebook alone processes 5 million ads per day.

B. Negative Impacts of Social Media Use

1. Opens the possibility for hackers to commit cyber crimes.

2. The platform can be used to spread disinformation.

• Example: Lahore rape case.

3. Children can be exposed to inappropriate content.

4. People, particularly children, face cyber-bullying.

• WHO reports that every one in five school-going child is bullied on the internet.

5. It can turn into an addiction and lead to lack of productivity.

10. What are the key features of Artificial Intelligence (AI)? Briefly explain how AI is being used in different fields and discuss its potential benefits and risks.

Defining Artificial Intelligence (AI)

AI is a technology that enables computers to simulate human intelligence.

John McCarthy, who coined the term, defines

AI as,

"The science and engineering of making intelligent machines."

Key Features of Artificial Intelligence

Artificial Intelligence can be distinguished from the following features:

1. Act Humanly

A computer/system must act humanly.

The Turing Test, an imitation game, determines whether a machine can act as intelligently as humans.

2. Think Humanly

When a system such as a car that works like a human is when it thinks humanly. Three cognitive techniques are

used for this achievement: introspection,

Psychological testing and Brain Imaging

3. Think Rationally

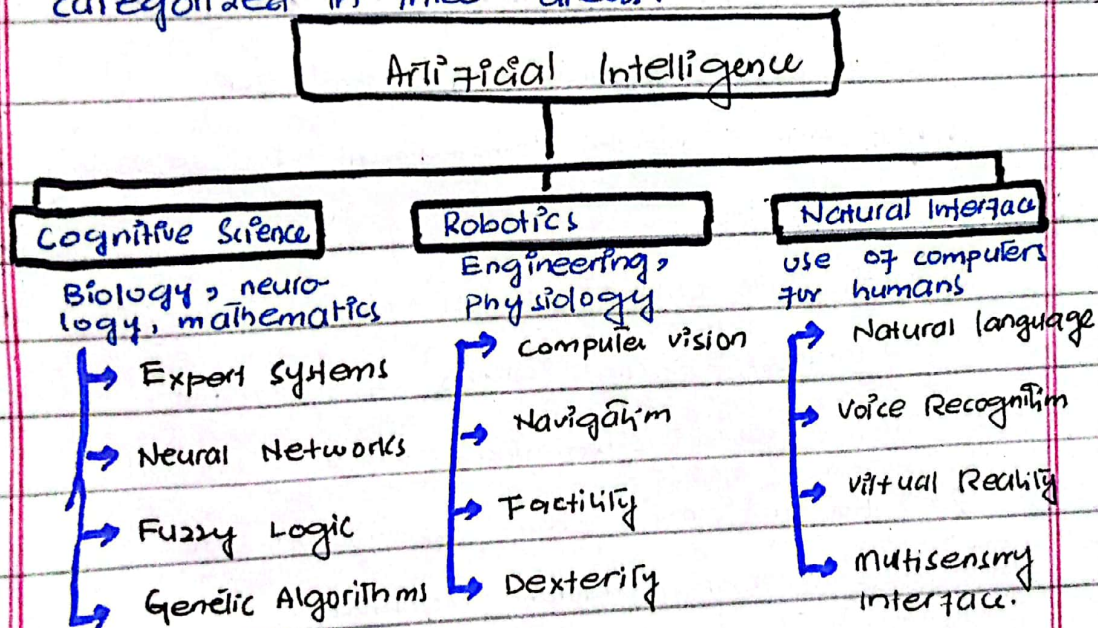
Computers must learn to solve problems rationally just like humans.

4. Act Rationally

The **black box** approach is applied to computers so that they act like humans under complex situations.

Application of AI in Different Fields

Broadly, the application of AI can be categorized in three areas:



Potential Benefits of Artificial Intelligence

AI offers benefits across various fields improving efficiency.

- 1. It enhances productivity by eliminating repetitive and dull tasks.

2. It improves decision-making by providing various analysis.

o Example: Medical AI by chatGPT.

3. It personalizes platforms for individual preferences.

o Example: Recommendations in Netflix.

4. It solves problems faster by optimizing traffic flow.

5. AI can aid in disaster risk management by tracking climate change.

Potential Risks of Artificial Intelligence

AI can pose the following potential risks.

1. It may lead to unemployment by replacing human jobs.

2. Since the output of AI tries to depict humans, certain results can contain bias and discrimination.

3. Human can overly depend on AI compromising human creativity.

4. It has the risk of unethical academic works.

o Example: Use of chatGPT for assignments and papers.

5. It can be misused in warfare for weapons and propaganda.

Example: Israel using Lavender for its targets.