Script

Water

Dear Students, in to-day's lecture, we will discuss about " Water sources, pollution and health hazards and its importance." The fallowing points are high lighted,

1. **History**
2. **Sources**
3. **Uses**
4. **Pollution**
5. **Health Hazards**

Introduction:

Water is the most mysterious and familiar substance in our lives.Water is called the 'universal solvent' because it dissolves more substances than any other liquid, because wherever water goes, either through the ground or through our bodies, it takes along valuable chemicals, minerals and nutrients. It is Colour less, odorless, most familiar and abundant liquid available on earth.

Pure water has a neutral pH of 7, which is neither acidic nor basic. Chemically, water is a compound of hydrogen and oxygen, having the formula H_2O. It is chemically active, reacting with certain metals and metal oxides to form bases. It reacts with certain organic compounds to form a variety of products, e.g., alcohols from alkenes since water is a polar compound, it is a good solvent. Although completely pure water is a poor conductor of electricity.

2: Sources of Water

Life is possible on earth due to the presence of water. Nearly three-fourths of the earth's surface is covered with water. Water is also found below the earth's surface and it is present in air in the form of water vapour.

These are the majour source of water ie, rainwater, oceans, rivers, lakes, streams, ponds and springs are natural sources of water. Dams, wells, tube wells, hand-pumps, canals, etc, are man-made sources of water.

Rain Water: Rain water collects on the earth in the form of surface water and underground water.

Underground Water: Some portion of the rainwater seeps through the soil on to the rocks below. Sometimes due to high pressure, this water comes out in the form of springs. It can be obtained by digging wells, wells, etc.

Surface Water: Water present on the surface of the earth in the form of oceans, rivers, lakes, ponds and streams is called surface water. It is inter connected, ie the water in rivers and lakes comes from rain and melting of snow on mountains.

Need of water

Water is probably the most important resource on Earth.We need water to grow and to stay alive. In fact, we could only live for a few days without drinking water. We also need water to grow plants and care for animals, cook our food, bathe and brush our teeth, flush the toilet, and wash our clothes

But did you know that most of the water on earth is ocean water? Ocean water is very salty. You can't drink it or use it for growing plants, cooking food, bathing, or washing clothes. The **freshwater,** comes from rain or snow that falls in rivers and lakes. It is also found stored in rocks beneath the ground.

Your body is estimated to be about 60 to 70 percent water and all the plants and animals body contain water. Blood is mostly water, and our muscles, lungs, and brain all contain a lot of water. Our body needs water to regulate body temperature and to provide the means for nutrients to travel to all your organs. Water also transports oxygen to your cells, removes waste, and protects your joints and organs.

Problems we are facing:

→ Inadequate access to safe drinking water by over 1.1 billion people
→ Groundwater over drafting leading to diminished agricultural yields
→ Overuse and pollution of water resources harming biodiversity
→ Regional conflicts over scarce water resources sometimes resulting in warfare.

Ensuring availability of water for future generations s most important question.

3:USES:

Water was also an important source of power in the period before the Industrial Revolution. Beginning with the Industrial Revolution, however, water increasingly becomes a important hidden factor in human history.

Without water, there would be no vegetation on land, no oxygen for human being, animals to breathe. Water is necessary to keep our bodies and the environment healthy and should be and protected as the precious resource.Earth's surface is covered by 71% water, only less than 2.7% of global water is fresh water and only less than 0.7% is available for human use. It is essential for life – can survive only a few days without water.

Reactant:

- Water, being a good solvent, allows many reactions to occur.
- Water is used in photosynthesis to make NADPH2, and ultimately sugar.
- These reactions release oxygen gas, which is vital to human life.

Without water in photosynthesis, organisms would not be able to obtain energy, and life as we know it would be impossible.

Lubrecant:

- When bones meet at a joint, they need a fluid between the bones to prevent scraping against each other.
- That fluid is called a synovial fluid, which is made mainly of water.
- Many internal organs have fluid around them to keep them protected. Examples:
  Brain: Cerebro-spinal fluid
  Lungs: Pleural Fluid

Eyes: Mix of fluids.

Important for Cell life: Water is a carrier for distributing essential nutrients to cells mainly minerals, vitamins and glucose.

Chemical and metabolic activity: It removes waste products from the body including toxins that the organs' cells reject, and removes them through urines and faeces.

Transport of nutrients:Water helps in the biochemical break-down of food, at the same time kidneys and liver use it to help flush out waste, as do your intestines. Waste through perspiration, urination, and defecation. Water is at the center of life and vital nutrient.

Body temperature regulation: Water has a large heat capacity which helps limit changes in body temperature in a warm or a cold environment. The body begins to sweat, and the evaporation of water from the skin surface very efficiently cools the body.

4: Pollution of water and source

Most at risk from environmental pollution are the 1.3 billion people in the developing countries of South East Asia and sub-Saharan Africa – almost one quarter of the world's population.

There is a clear link between poverty and pollution. Poverty determines the environmental risks individuals face: where they live, their access to clean water and proper sanitation, and their exposure to various kinds of environmental pollutants, while limiting their access to adequate resources for dealing with those risks. Unable to afford clean fuels, the poor depend on dirty fuels for cooking and heating, filling their dwellings with smoke; their dwellings are usually located near roadways, waste

dumps, or industrial areas, subjecting them to a daily barrage of air pollution, noise, and the risks of toxic spills

Source of Pollution

The main sources of pollutants are agricultural, industrial, municipal and transportation operations. Agricultural pollutants include insecticides, herbicides, pesticides, natural and chemical fertilizers, drainage from animal feedlots, salts from field irrigation. Pollution is defined as the presence of impurities or pollutant substances in sufficient concentration levels, causing harmful effects on human beings, animals, plant life.

The human activities, industry, agriculture, mining, deforestation, power generation, cause water pollution. Population growth and unplanned urbanization also contribute to pollution of water. Factories and mines release large quantities of toxic chemicals, organic wastes, heavy metals, heated effluents, inert wastes and radioactive wastes causing water pollution. Toxic chemicals / wastes are not easily degradable by biological means. DDT and mercury fall under this category.

The water contaminated by them is highly poisonous and if contacted or consumed by plants or animals, may prove fatal. Other examples are pesticides and herbicides which wash off from the land during rainy season into the water sources. Organic wastes refer to rotting organic matter, which generate foul smell. Examples are waste from humans, tanneries, and paper and pulp industries.

These wastes, when discharged into water sources decompose using large amounts of oxygen from water rendering water useless. The pollution level is indicated by a parameter, BOD (bio-chemical oxygen demand). With oxygen depletion, some types of fish perish in these water bodies. Urban sewage is another example of organic waste, generally released into rivers, lakes or tanks in most of the developing countries.

The inert wastes such as metals, oil films, silt settle to the bottom, if not removed, and affects plant life at the bottom of the water bodies. This is not a very serious pollution problem. The radioactive wastes are generally dumped into oceans; if proper disposal techniques are not followed, these wastes create serious pollution of oceans. This aspect is discussed later. It is estimated that many countries will have fresh water shortage by 2025.

Environment pollution:

Modern hazards resulting from rapid development without environmental safeguards: Urban air pollution, contaminated water and soil, noise, and lack of proper sanitary disposal for increasing quantities of waste from household garbage to industrial and medical waste.

The ultimate cause of pollution is human activity itself. Human activities mainly include: industries for various human needs both directly and indirectly, agriculture for food production and industrial needs, health care for health of human beings and animals, transport for mobility of human beings.

The nature and concentration of a pollutant determine the severity of its detrimental effects on human health. Impurities released directly from the source of origin are known as primary pollutants, for example, CO, SO_2, NO. When contaminants like HC, NO, O_3, combine in the atmosphere (moisture, sunlight) to form new products like PAN (peroxy acetyl nitrate), petrochemical smog, formaldehyde, which are known as secondary pollutants

List of Industries causing different types of pollution:

No	**Type of industries**	**Type of pollution**
1	Manufacture of gases	Air pollution
2	IT based industries	Air pollution
3	Cement, steel and other mine based industries	Air pollution and solid wastes, noise pollution

4	Textile industries and their ancillaries	Water pollution, air pollution, noise pollution
5	Transport vehicle manufacturing	Solid wastes, noise pollution, air pollution
6	Petroleum based industries	Water pollution, air pollution
7	Food industry	Water pollution, air pollution, food pollution
8	Paper industry	Water pollution, air pollution, solid wastes, sound pollution
9	Electrical appliances and electric goods industries	Solid wastes and air pollution
10	Aircraft industry	Solid wastes, water pollution, air pollution

Major **Disease-causing agents**:

Bacteria, viruses, protozoa and parasitic worms that enter water from domestic sewage and animal wastes. In developing countries they are the major cause of sickness and death, prematurely killing an average of 13,700 people every day.

Oxygen-demanding wastes:

Organic wastes, which can be decomposed by oxygen-consuming bacteria. Large populations of bacteria supported by these wastes can deplete water of dissolved oxygen gas. Without enough oxygen, fish and other oxygen consuming forms of aquatic life die.

Water-soluble inorganic chemicals:

Acids, salts, and compounds of toxic metals such as lead and mercury. Such dissolved solids can make water unfit to drink, harm fish and other aquatic life, decrease crop yields, and accelerate corrosion of equipment that uses of water.

Inorganic plant nutrients:

Water soluble nitrate and phosphate compounds that can cause excessive growth of algae and other aquatic plants, which than die and decay, depleting water of dissolved oxygen and killing fish.

Organic chemicals:

Oil, gasoline, plastics, pesticides, cleaning solvents, detergents and many other water soluble and insoluble chemicals that threaten human health and harm fish and other aquatic life.

Sediment or suspended matter:

Suspended particulate matter clouds the water, reduces the ability of some organisms to find food, reduces photosynthesis by aquatic plants, disrupts aquatic food webs, and carries pesticides, bacteria and other harmful substances. Bottom sediments destroys feeding and spawning grounds of fish and clogs and fills lakes, artificial reservoirs, stream channels and harbors.

Radioactive substances:

Radioisotopes that are water soluble or capable of being biologically amplified to higher concentrations as they pass through food chains and webs. Ionizing radiation from such isotopes can cause birth defects, cancer, and genetic damage.

Heat:

Large quantity of water is heated when it is used in the cooling towers of thermal power plants. When this hot water is discharged in to the nearby water bodies it causes an increase in its temperature. This increase in water temperature lowers dissolved oxygen content and makes aquatic organisms more vulnerable to disease, parasites and toxic chemicals.

5: Health Hazards of Water pollution:

Effects of Pollution:

Different types of water uses require different levels and the highest level of purity being required for drinking water. Pollutants bring many physical and chemical changes in water.

Industerial wastes and suspended particles make water turbid; dyes, chromium and iron compounds change the colour of water; oils, detergents, hydrocarbons, chlorine etc. are impart contaminants. As it is a vital resource essential for life, contamination of water has effects on the health and environment of living organisms.

- Phosphorus and Nitrates from fertilizers and detergents contaminate promote the growth of oxygen consuming algae which reduce the DO level of water, killing fish and other aquatic organisms.
- Industrial effluents result in the addition of poisonous chemicals such as Arsenic, Mercury, Cadmium, Lead etc., which kill aquatic organisms and may reach human body through contaminated aquatic foods.
- Domestic, commercial and industrial effluents eg, paper mills, slaughter houses, contaminate the water with organic pollutants. Micro-organisms which decompose the organic matter and consume oxygen and reduce the DO level of the aquatic system thereby killing the aquatic organisms.
- Waterborne infectious enteric diseases like typhoid, bacillary dysentery, cholera and amoebic dysentery are the predominant health hazards arising from contaminated drinking water.
- Fluoride containing pollutants cause fluorosis i.e. neuromuscular, respiratory, gastro intestinal and dental problems.
- Oil pollutants have been known to be responsible for the death of many water birds and fishes.
- Radio-active pollutants near industrial area water sources enter humans through food and water and get accumulated in the blood, thyroid gland, liver, bones as well as in muscles.

Water borne diseases:

Many back word countries according WHO report that water related diseases cause 3.4 million deaths each year. Contaminated water can cause many types of diarrheal

diseases, including Cholera, and other serious illnesses such as Guinea worm disease, Typhoid, and Dysentery.

Microorganisms causing diseases that characteristically are waterborne prominently include protozoa and bacteria, many of which are intestinal parasites.

Amebiasis	*Entamoeba histolytica* parasite	Diarrhea, stomach pain, and stomach cramping	Fecal matter of an infected person (usually ingested from a pool or an infected water supply)
Cholera	*Vibrio choleraebacteria*	Watery diarrhea, vomiting, and leg cramps	Contaminated drinking water, rivers and coastal waters
E. Coli 0157:H7	*Escherichia colibacteria*	Diarrhea (may be bloody), abdominal pain, nausea, vomiting, fever, HUS	Undercooked ground beef, imported cheeses, unpasteurized milk or juice, cider, alfalfa sprouts
Hepatitis A	*Hepatitis A virus*	Fever, fatigue, stomach pain, nausea, dark urine, jaundice	Ready-to-eat foods, fruit and juice, milk products, shellfish, salads, vegetables, sandwiches, water
Salmonellosis	*Salmonellabacteria*	Abdominal pain, headache, fever, nausea, diarrhea, chills, cramps	Poultry, eggs, meat, meat products, milk, smoked fish, protein foods, juice
Vibrio Infection	*Vibrio parahaemolyticus, Vibrio vulnificusbacteria*	Nausea, vomiting, headache (a quarter of patients experience dysentery-like symptoms)	Raw shellfish, oysters
Viral Gastroenteritis	*Calicivirus virus*	Diarrhea, vomiting, nausea, cramps, headache, muscle aches, tiredness, slight fever	Water, ready-to-eat foods (salad, sandwiches, bread) shellfish
Enterobiasis	*Enterobius vermicularis*	Drinking water contaminated with	Peri-anal itch, nervous irritability, hyperactivity

		eggs	and insomnia
Botulism	*Clostridium botulinum*	Bacteria can enter an open wound from contaminated water sources. Can enter the gastrointestinal tract through consumption of contaminated drinking water or (more commonly) food	Dry mouth, blurred and/or double vision, difficulty swallowing, muscle weakness, difficulty breathing, slurred speech, vomiting and sometimes diarrhea. Death is usually caused by respiratory failure.
ysentery	*Caused by a number of species in the genera Shigella and Salmonella with the most common being Shigella dysenteriae*	Water contaminated with the bacterium	Frequent passage of feces with blood and/or mucus and in some cases vomiting of blood.
Leptospirosis	*Caused by bacterium of genus Leptospira*	Water contaminated by the animal urine carrying the bacteria	Begins with flu-like symptoms then resolves. The second phase then occurs involving meningitis, liver damage (causes jaundice), and renal failure
titis Externa(swimmer's ear)	*Caused by a number of bacterial and fungal species.*	Swimming in water contaminated by the responsible pathogens	Ear canal swells, causing pain and tenderness to the touch
Campylobacteriosis	*Most commonly caused by Campylobacter jejuni*	Drinking water contaminated with feces	Produces dysentery like symptoms along with a high fever. Usually lasts 2–10 days.

Conclusion:

Global water demand is largely influenced by population growth, urbanization, food and energy security policies, and macro-economic processes such as trade globalization, changing diets and increasing consumption. By 2050, global water demand is projected to increase by 55%, mainly due to growing demands from manufacturing, thermal electricity generation and domestic use.

Water is the only substance in world to be found naturally in all 3 states. (Solid: Ice, Liquid: Water, Gas: Water Vapor. Water freezes at 0C and boils at 100C.66% of the human body is water; 75% of the human brain is water. Water regulates the earth's temperature. It also regulates the temperature of the human body, carries nutrients and oxygen to cells, cushions joints, protects organs and tissues, and removes wastes. One in five children in the developing world do not live to see their fifth birthday Lack of adequate water, sanitation, and hygiene causes seven percent of death and disease globally Very large amounts of water go down the drain without being used. To conserve water, try some of these ideas:

- Turn the water off while you are brushing your teeth or washing your face.
- Take shorter showers, and don't fill the tub all the way when you take a bath.
- Don't leave the garden hose on all night when watering plants.
- Make sure the dishwasher and washing machine are full each time your family does a load.

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