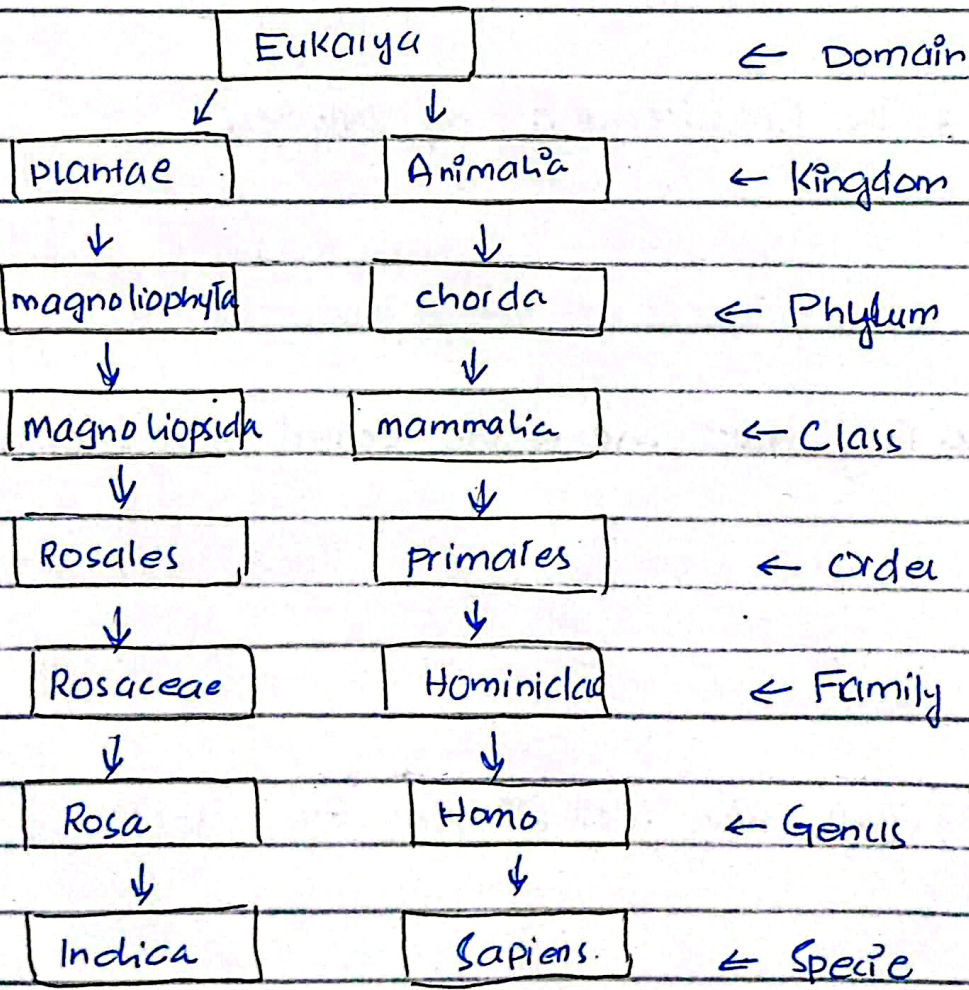


1) Compare and contrast the characteristics of plants and animals, highlighting both similarities and differences.

Answer

Animal and plants come from the same domain, that is, Eukarya and part way in their taxonomical hierarchy at their respective kingdoms. An example of their taxonomical grouping of Rose and human beings is as follows:



Rosa Indica

Homo Sapiens

← Scientific Name

Similarities

Diag

1. Multi Cellular Organisms

Both plants and animals are multicellular organisms. It is why they are called eukaryotes.

2. Domain

All the living organisms on earth are divided into three domains: Archaea, Bacteria, and Eukarya. Both animals and plants belong to the domain of Eukarya.

3. The Requirement of oxygen

All plants and animals need oxygen for their survival. They need oxygen for respiration — converting food into energy.

4. They have membrane-bound organelles

Unlike Archaea and Bacteria, ^{cells of} Eukarya (plants and animals) have membrane bound organelles such as the nucleus, mitochondria, and chloroplasts.

5. Both have cell division by mitosis

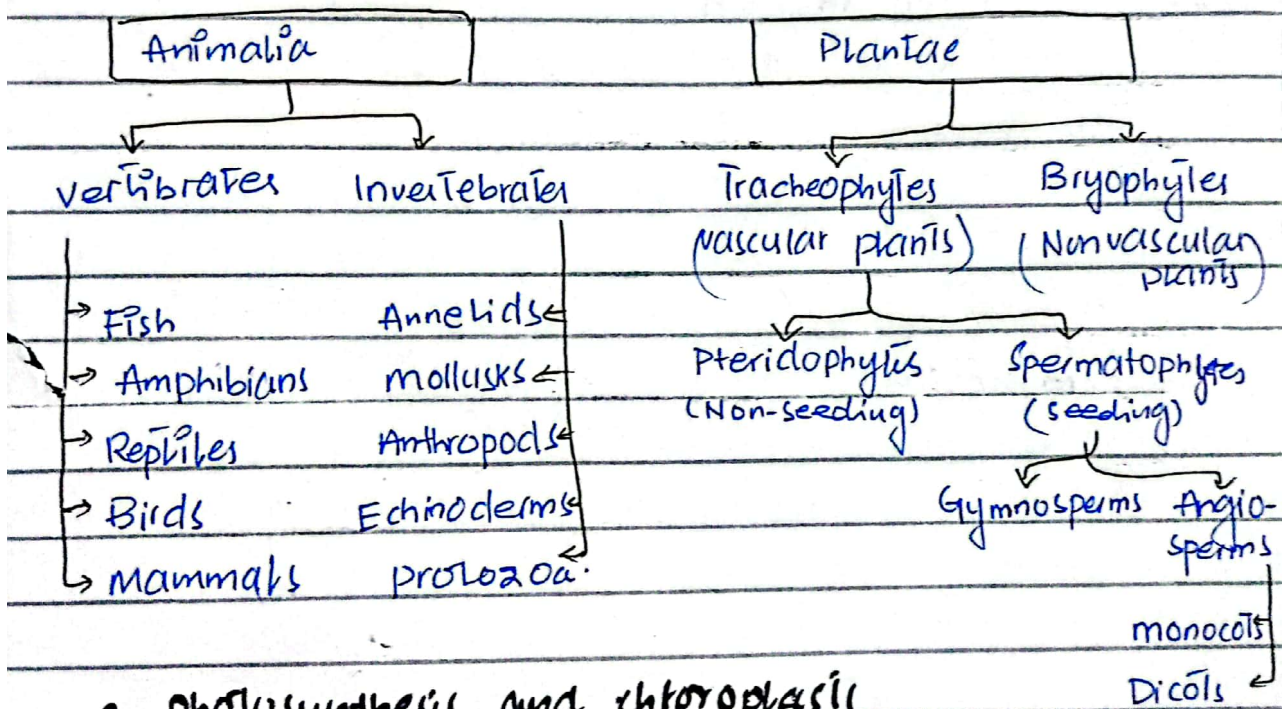
As multicellular organisms, both animals and plants' cells divide through mitosis and not binary fission.

Differences

Animals and plants differ in the following ways:

1. Separate Kingdoms

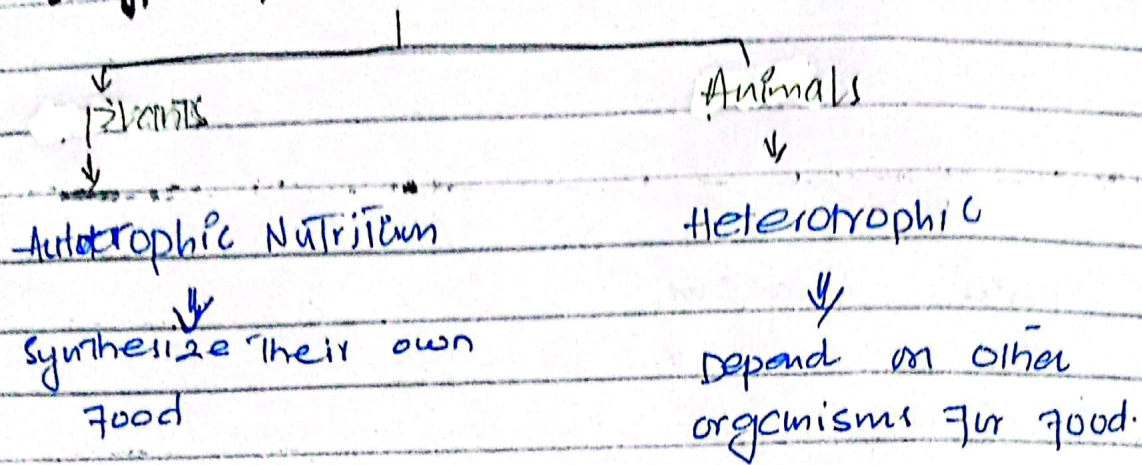
Animals belong to kingdom Animalia while plants to plantae, and their Linnean classification differs onwards.



2. Photosynthesis and chloroplasts

Some plants have chloroplasts and they photosynthesize. Animals on the other hand do not have this characteristic.

3. Type of nutrition



4. Cell walls in cells

Plants have cell walls in their cells and are made up of cellulose.

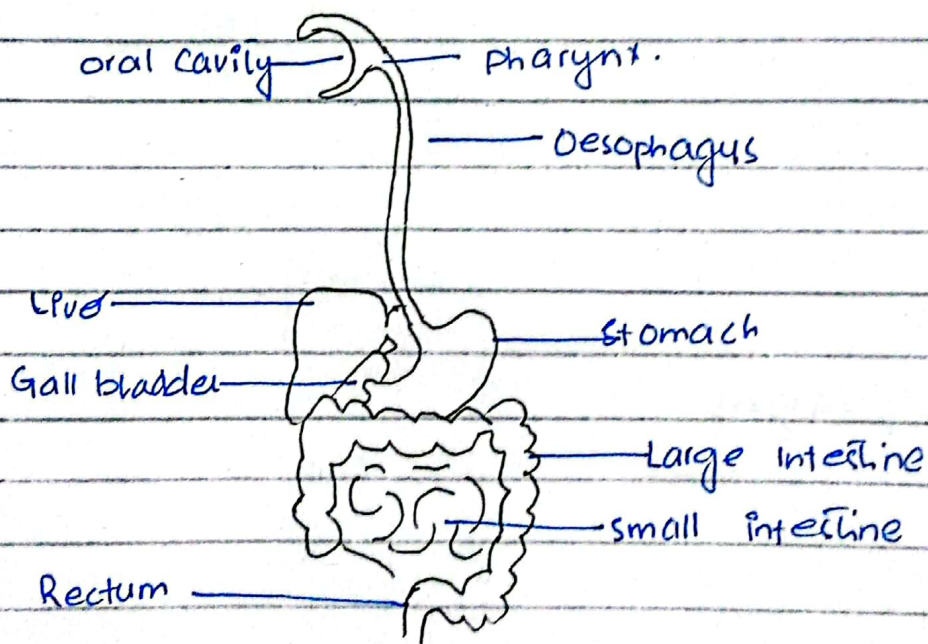
Animals do not have cell walls in their cells. e.g.

5. Locomotion

Locomotion refers to movement from one place to another. Plants do not show locomotion as they are fixed with their roots to the ground. Animals move for their survival.

2) Describe the function of digestive system in humans. What are the key organs involved in digestion and absorption?

The digestive system is a network of organs that help in digestion. Digestion is a process of breaking down of food by mechanical and enzymatic action by a system of organs, and then absorbed by the blood.



Function of the Digestive System

mechanical + chemical breakdown of food \Rightarrow Absorption by blood
 \downarrow
Nutrition to body
 \downarrow
Sustenance of life.

Key organs involved in Digestion and Absorption

The alimentary canal beginning from mouth and ending to anus comprises the digestive tract. Other organs such as liver and pancreas play part in digestion. Blood capillaries absorb the broken food.

Oral cavity

Break down of food mechanically by teeth, the process being mastication. Enzymes in saliva break down some carbohydrates. The chewed food in the form of bolus is pushed towards the oesophagus.

Oesophagus

A 25 cm tube that connects mouth and the stomach. Food advances from here by means of rhythmic muscle contraction called peristalsis, squeezing the food to stomach. The process takes 2-3 seconds.

Stomach

At the end of oesophagus is a muscular valve sphincter allowing food to enter the stomach. It is a J-shaped organ that breaks down food into digestible pieces using acids and enzymes.

Gastric glands produce three types of gastric juices:

- 1) Mucous → protect innermost layer of stomach.
- 2) Hydrochloric acid → kills possible microorganisms and converts pepsinogen into pepsin.
- 3) pepsinogen → the converted pepsin breaks proteins to polypeptides.

The food is converted into a thick liquid called chyme. It then passes through pyloric sphincter into small intestine.

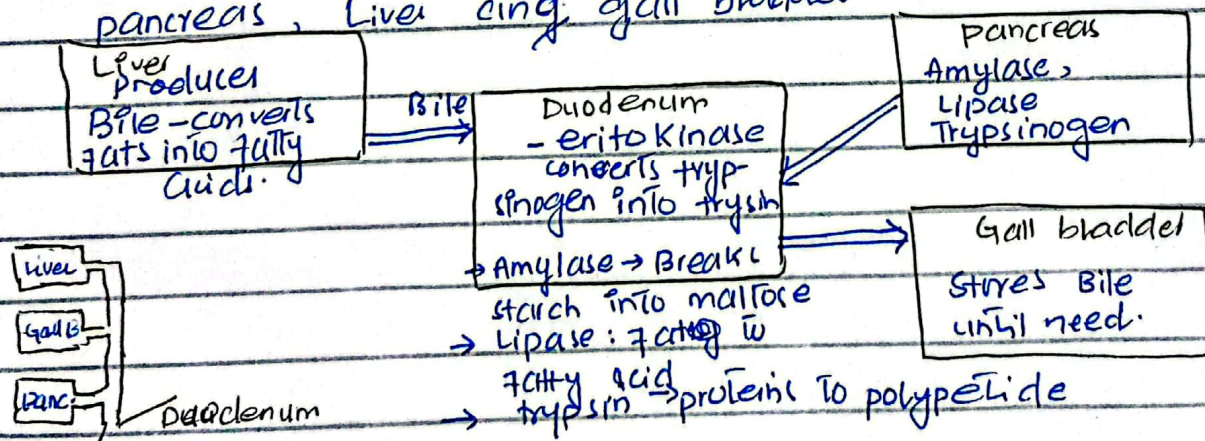
→ 10% digestion takes place in stomach.

Small Intestine (About 6 m long)

It is divided into three sections:

1) Duodenum

About 20-25 cm long, it releases enterokinase enzyme. It is connected with pancreas, Liver and gall bladder.



2) Jejunum

About 4-5 m long, digestion completes here.

Releases intestinal juice:

- Aminopeptidase → converts polypeptides into dipeptides.

Enzymes

- o Trypsin converts dipeptides into amino acids.
- o Lipase converts fats into fatty acids.
- o Maltase converts maltose into glucose
- o Lactase converts lactose into glucose.

3) Ileum

It is the main absorption location. About five to six million hairlike structures called villi absorb the nutrients. Beneath villi are capillaries of ^{the} blood stream and lacteals of lymphatic system.

Sugars and amino acids → blood stream

Fatty acids and glycerols → lymphatic system.

Large Intestine

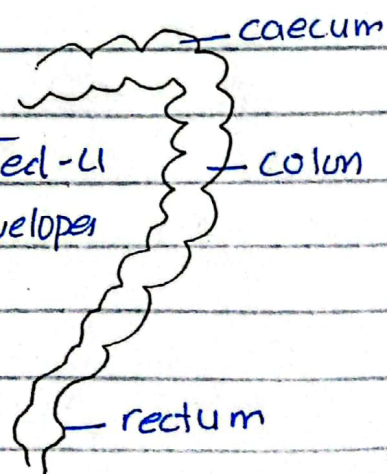
It is about 2.5 m long and wider than small intestine. - Inverted-U and begins from lower right, envelopes ^{lower} small intestine and ends at left side of the body.

At caecum - water is absorbed.

At colon, bacteria promote

further breakdown and absorption of minerals and vitamins. take place.

The rectum stores the undigested food, digestive juices, bacteria and mucus - faeces until elimination. Then through anus faeces pass out of the body.



3) Explain the causes and symptoms of malaria. How is it spread and what measures can be taken to prevent this transmission?

Malaria is communicable disease that spreads from person to person through a parasite. ~~with~~ World Health Organization reports reveal that in 2022 249 million cases of malaria were reported around the world with 60800 deaths.

Causes of malaria

The cause of malaria is ^{parasite} parasites. There are 5 species of malaria responsible for it. 2 of these, that are *P. falciparum* & *P. vivax* are the greater risk.

These parasites live in female mosquitoes, Anopheles and when they bite into human skin with malaria, the mosquito acts as a vector and carries the plasmodium parasite to the uninfected person.

Symptoms of Malaria

The symptoms usually start within 10-15 days of getting bitten by the infected mosquito. Normally, a person who has had malaria before gets mild symptoms. There can also be severe symptoms especially

For the children, pregnant women and people with AIDS:

- o Extreme tiredness and fatigue.
- o Impaired consciousness
- o Difficulty breathing
- o Dark or bloody urine.
- o Jaundice (yellowing of the eyes and skin).

Transmission of malaria

Anopheles feed on human blood to obtain protein they need to develop their eggs.

When they bite the person with plasmodium, it goes to the mosquito's gut and forms into infective disease stage.

Then, when the mosquito bites into an uninfected person, as the anophele injects the coagulant to prevent blood meal from clotting, the parasites are also injected, infecting the person.

Preventing malaria

Malaria can be prevented in three ways:

- 1) Human efforts
- 2) Vector control
- 3) Vaccination.

1) Human Efforts - Protection against mosquitoes.

They include efforts like:

- use of mosquito nets.
- use of repellents after dusk
- use of coil and vaporizers.
- wearing protective clothing
- use of window screens.

2) Vector control. - Killing of the mosquitoes.

- Insecticide-treated nets (ITNs)
- Indoor Residual Spraying (IRS).

3) Vaccination

Since 2021, WHO has recommended broad use of RTS malaria vaccines among children.

In ^{Oct} 2023, WHO recommended another safe vaccine R21 vaccine effective for malaria prevention.

Treating malaria

malaria, after the transmission can be treated. Early diagnosis can reduce the symptoms. Additionally, ACT drugs are used to treat malaria.

Malaria Elimination

WHO has begun malaria-free campaigns and certifying countries for malaria elimination. So far, 12 countries are malaria-free, including Sri Lanka, China, with latest addition of Azerbaijan, Pakistan and Belize in 2023.

4) What are the main advantages and disadvantages of using biofuels? Describe specific examples of how biofuels are produced.

Biofuels are fuel that are produced over a short time span from biomass rather than by very slow and natural processes of formation of fossil fuels such as oil.

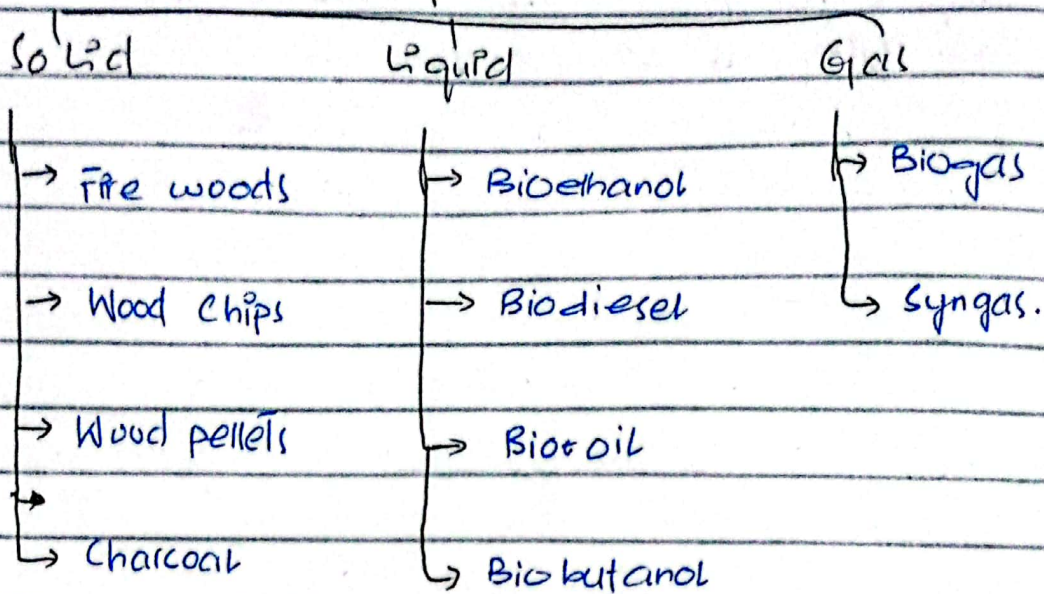
Biofuels are inexhaustible and biodegradable. Currently, they cover 10% of total world energy demand.

Biomass feedstock

Biomass is the material from which ~~to~~ biofuel is produced. It includes:

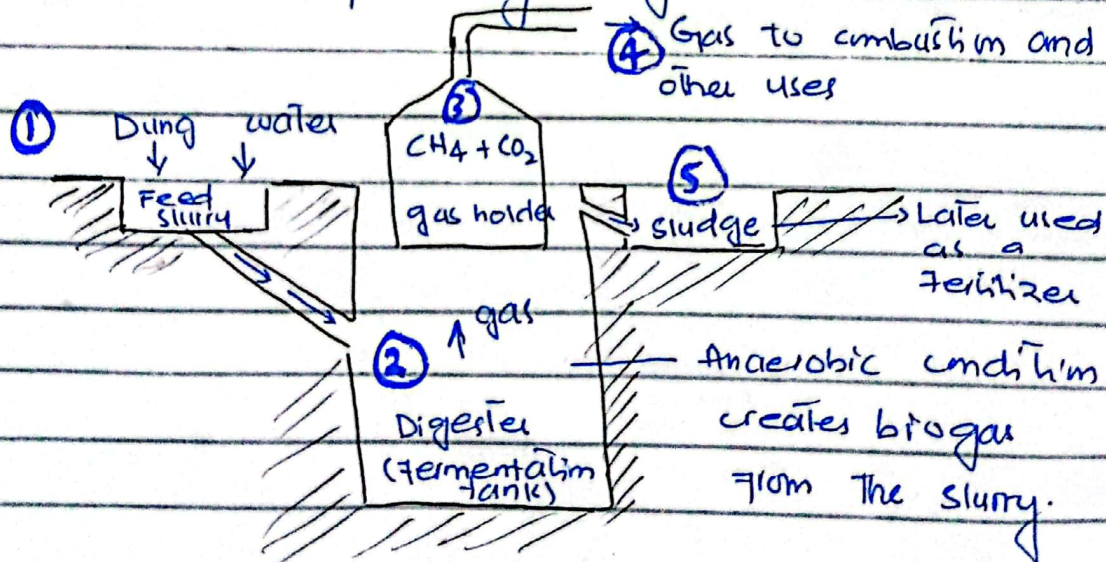
- ① Grains and starch crops - sugarcane, wheat etc
- ① Agricultural residue - corn stover, wheat straw,
- ① Food waste
- ① Forestry materials - logging residue, forest-thinning.
- ① Animal byproducts - Tallow, fish oils, manure
- ① Energy crops - switch-grass, algae.
- ① Urban and suburban waste - municipal solid waste, waste cooking oil.

Biofuel Types



Biofuel production

Of the above, biogas production takes place in the following way:



Advantages of Biofuels

The fossil fuels are perishable and once used up completely, humans will not have its access for generations. Therefore, biofuels are a better alternative for the following reasons:

- 1) They are a renewable resource - They can be renewed unlike non-renewable fossil fuels.
- 2) They emit lesser green house gases. They reduce GHGs by 65%.
- 3) They provide economic security. This is particularly for those countries that do not have natural fossil fuel reserves.
- 4) They are easily made in a short span of time, unlike natural fuels which take millions of years.
- 5) They are biodegradable implying that they are environmental friendly and produce no ecological waste.

Disadvantages of Biofuels

1) They disturb the cycle. Fossil fuel are to be consumed and plants are to be used for human needs and ecological balance.

2) High transition cost shall be required to switch from fossil fuel engines to biofuel engines.

3) ^{more} Agricultural Land ^{use} ~~loss~~ will ^{increase} ~~require~~ demand for lands.

4) The crops used for biofuel production will lead to food insecurity.

5) At present, more energy is required for producing biofuel than they can generate. For example, ethanol from corn requires 29% more energy than the end product is generating.

5) Describe the layered structure of the Earth's atmosphere. Briefly explain the composition and importance of each layer.

The atmosphere is a mixture of gases that surround the earth. It is one of the four components of the Earth's environment. The other three are hydrosphere, biosphere and lithosphere.

Gases in the atmosphere

Constant Gases

The concentration do not change over time and place.

→ Nitrogen : 78%

→ Oxygen : 21%

→ Inert gases : 1%

Variable gases.

These are the gases whose concentration change from time to time and place to place.

→ Carbon di oxide

→ water vapour

→ Ozone.

Structure of Atmosphere

Structurally, earth's atmosphere is divided into five distinct layers:

1) Troposphere

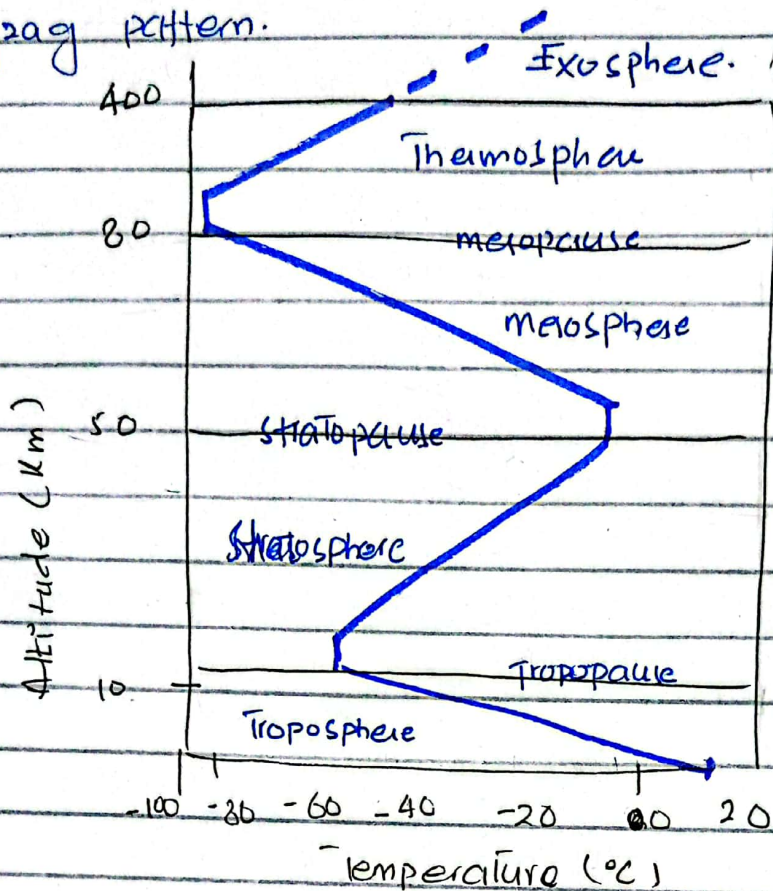
2) Stratosphere

3) mesosphere

4) Thermosphere

5) Exosphere

With altitudes the temperature varies in a zigzag pattern.



Troposphere

It extends up to 12 km on average (8 km at poles and 18 km around equator).

Life thrives in this layer as it has all the gases needed for life. It has water vapours.

Weather changes occur within this layer.

The temperature decreases up to to -53°C with 1°C drop every 165 m altitude.

This is called normal lapse rate.

Tropopause, the transitional zone separates troposphere and stratosphere.

Stratosphere

It extends from 12 km to 50 km from earth's surface. This layer is very dry and has little moisture. It contains the ozone layer which separates protects life from harmful ultraviolet radiation. The temperature increases and comes to -3°C . The phenomenon where temperature increase with height is called temperature inversion.

Stratopause divides stratosphere and mesosphere

Mesosphere

As the middle layer of the earth's atmosphere extending from 50 km to 80 km. By 80 km, the temperature reaches 93°c being the coldest layer. Meteorites burn in this layer despite lower temperatures because of the absence of ozone layer

mesopause separates mesosphere and thermosphere.

Thermosphere

This layer extends from 80 km to 400 km. Radiowaves transmitted by this layer.

The Lower Thermosphere is called ionosphere.

It consists of electrically charged particles called ions and caused by cosmic and solar radiations. Auroras are formed here. To

temperature increase with height reaching up to 2000 °C.

Exosphere

It is the final frontier of Earth's gaseous envelope. It blends into outer space. This is where most of Earth's satellites travel.

Importance of atmosphere

o Oxygen cycle is maintained through constant oxygen concentration.

o It is transparent and, therefore, solar radiation reach earth's surface enabling plants' photosynthesis and sustaining life.

o The Ozone Layer prevents about 95% of harmful radiations.

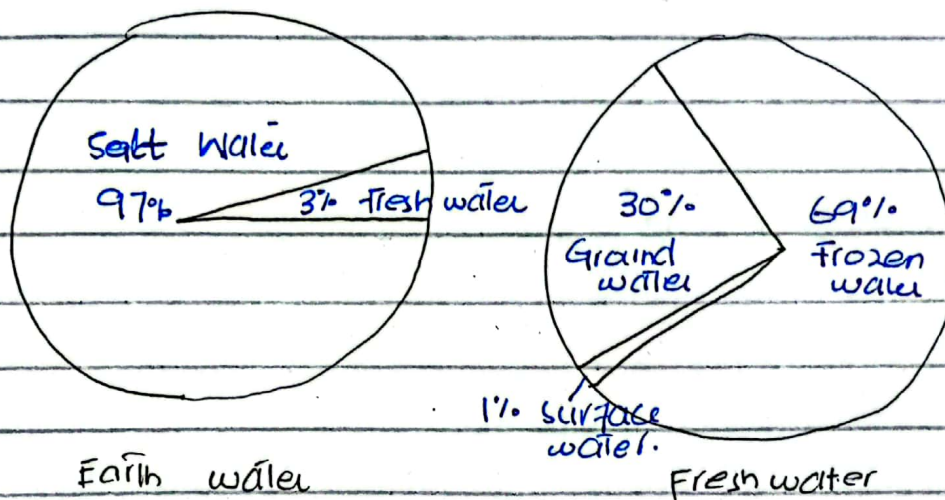
o Wind pattern that contribute to cyclones, storms and tornadoes can be studied by studying the complex atmosphere.

o It protects ^{large} ~~best~~ from outer space.

6) Explain the process of water cycle, highlighting major water compartments involved

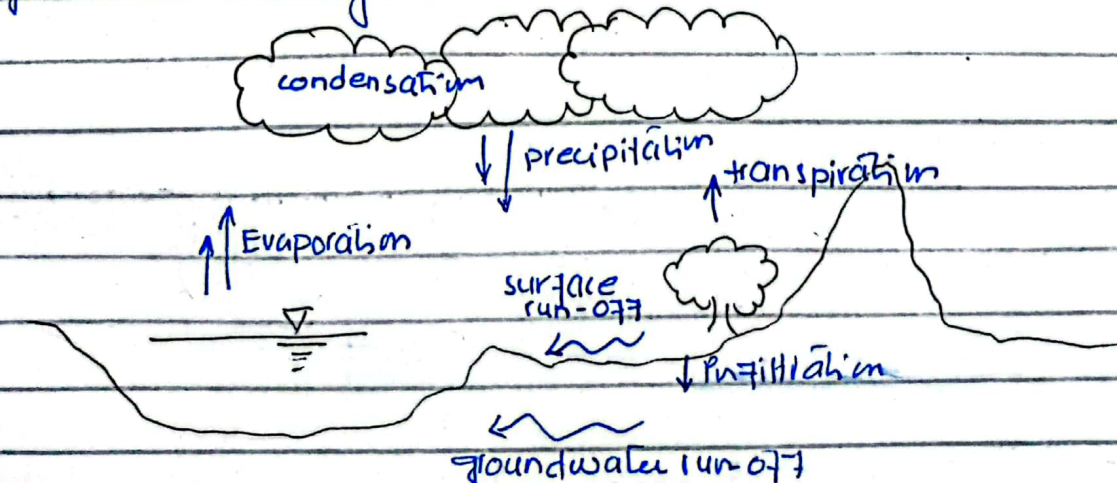
The water cycle is a biogeochemical cycle that involves the movement of water on, above and below the surface of the earth.

The global water distribution is as follows:



The process of water cycle

Water cycle involves various processes that go on in a cyclic manner.



Evaporation

In this process, water evaporate from water bodies including oceans, lakes, and river. Air pressure and predominantly temperature warm these catchment areas resulting in evaporation.

Transpiration

Transpiration is the process in which water evaporates from the leaves of plants. This process is very significant in forests.

Condensation

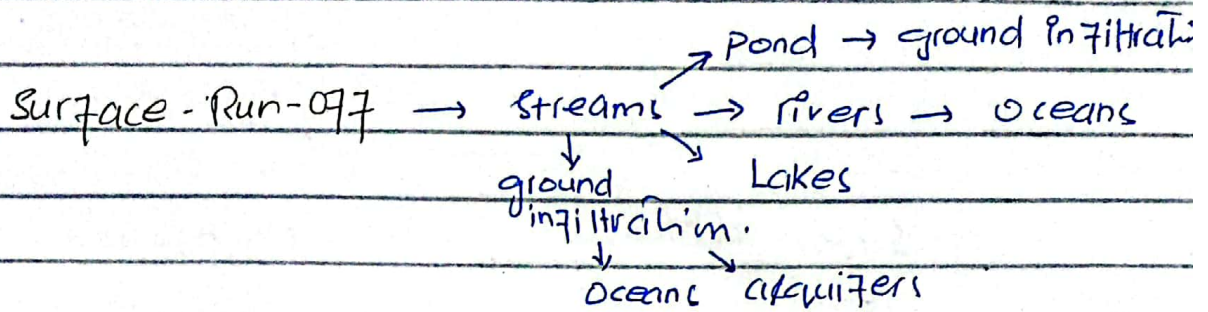
The evaporated and transpired water vapors accumulate in the atmosphere and form water droplets due to fall in temperature with altitude. They collect and form clouds.

precipitation

When the clouds fall become heavy with water. along with other factors, the particles of water fall on the ground from the atmosphere. Depending on temperature, it can fall as rain, snow, sleet or hail.

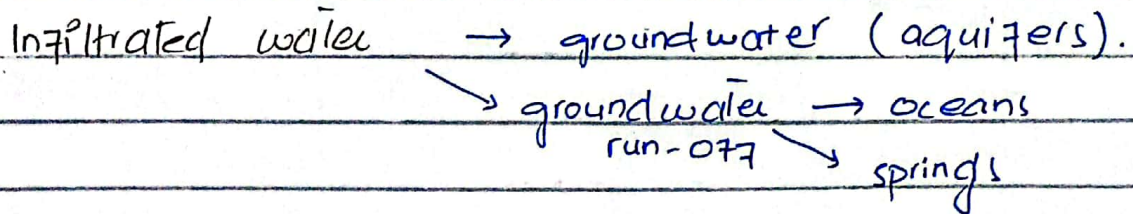
Surface Run-off

The water that stays in motion on the ground is surface run-off. It can have various destinations.



Infiltration

Other than run-off, some water is percolated in the ground. It too takes various forms



major water compartments

The water that moves around on above and under the earth can be divided into various compartments.

A water compartment is an area where water is stored. The water circulates but is replaced due to the cycle.

The United States Geological Survey (USGS) divides the Earth's water into following compartments.

Ocean, Seas
And Bays
96.54%

Frozen water
(Cryosphere)
1.74%

Groundwater
1.69%

Soil moisture
0.001%

Lakes

0.13%

Rivers

0.0002%

Atmosphere

0.001%

Biological water

0.0001%

7) Identify and describe the sources, causes and effects of at least three major air pollutants.

Air pollution occurs when the air contains gases, dust, fumes or odour in harmful amounts. Air is an essential component for life and if polluted can affect life severely. Some major air pollutants and their sources, cause and effects are: (According to World Health Organisation)

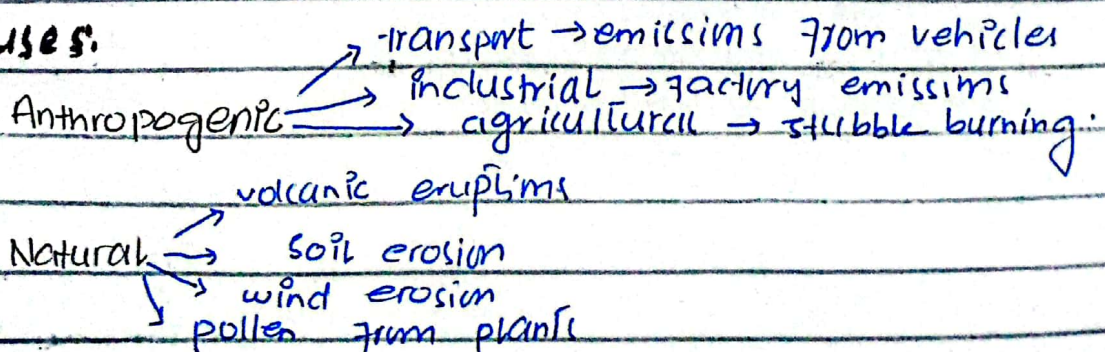
1. Particulate matter (pm)

They are atmospheric microscopic particles of solid or liquid suspended in the air

Sources :

- o construction sites
- o wild fires
- o wood burning
- o gravel pits
- o agricultural activities
- o dusty roads.

Causes:



Effects:

- o lung disease
- o respiratory infections
- o heart disease
- o alter plant growth and disturb aquatic life.

Solution:

- o Reduce its sources such as burning.
- o using vents and air purifiers
- o paving roads to avoid dust.

2. Carbon mono-oxide (CO)

CO is a colorless, odourless and tasteless toxic gas produced by the incomplete combustion of carbonaceous fuels such as petrol, charcoal, natural gas, wood and kerosene.

Sources:

- o vehicles petrol
- o furnaces or boilers gas
- o charcoal
- o woods.

Causes:

- o Burning of fuel by vehicles
 - o Furnaces and boilers
 - o Industrial combustion.
 - o Volcanoes
 - o Forest fires
- } anthropogenic
- } natural.

Effects: (in adequate oxygen supply to brain)

- o Fatigue
- o Dizziness
- o Shortness of breath.

Solution:

- o From combustible to electric engines.
- o Hyperbaric oxygen therapy for CO poisoning.
- o Use of renewable energy.

3. Ozone (O_3) (tropospheric ozone)

Ground level ozone is a trace gas harmful to human health and environment.

Sources:

- o Volatile organic compounds such as formaldehyde
- o Nitrogen oxides

Causes:

Anthropogenic → vehicular combustion
→ industrial and agricultural activities.

Natural → lightning NO_x
→ Biogenic hydrocarbon emissions
→ wild fires

Effects:

- o Running eyes
- o Throat irritation
- o chest complications.

Solution:

- o choosing public transport
- o Commercial and domestic emission controls.

4. Nitrogen dioxide (NO_2)

Sources :

- fossil fuels
- explosions

Causes :

- Anthropogenic → vehicular emission
→ commercial
- Natural → lightning NO_x .
→ microbial processes in soil.

Effects :

- chronic lung disease
- affects senses like ability to smell.

Solution :

- using low nitrogen fuel such as natural gas
- sustainable uses of resources.

5. Sulphur dioxide (SO_2)

Sources :

- fossil fuels esp coal.
- Nature

Cause :

- Anthropogenic → Burning of fuels by power plants
→ smelting of mineral ores containing sulphur.
- Natural → volcanic eruptions

Effects :

- Acid rain
- Respiratory complications.

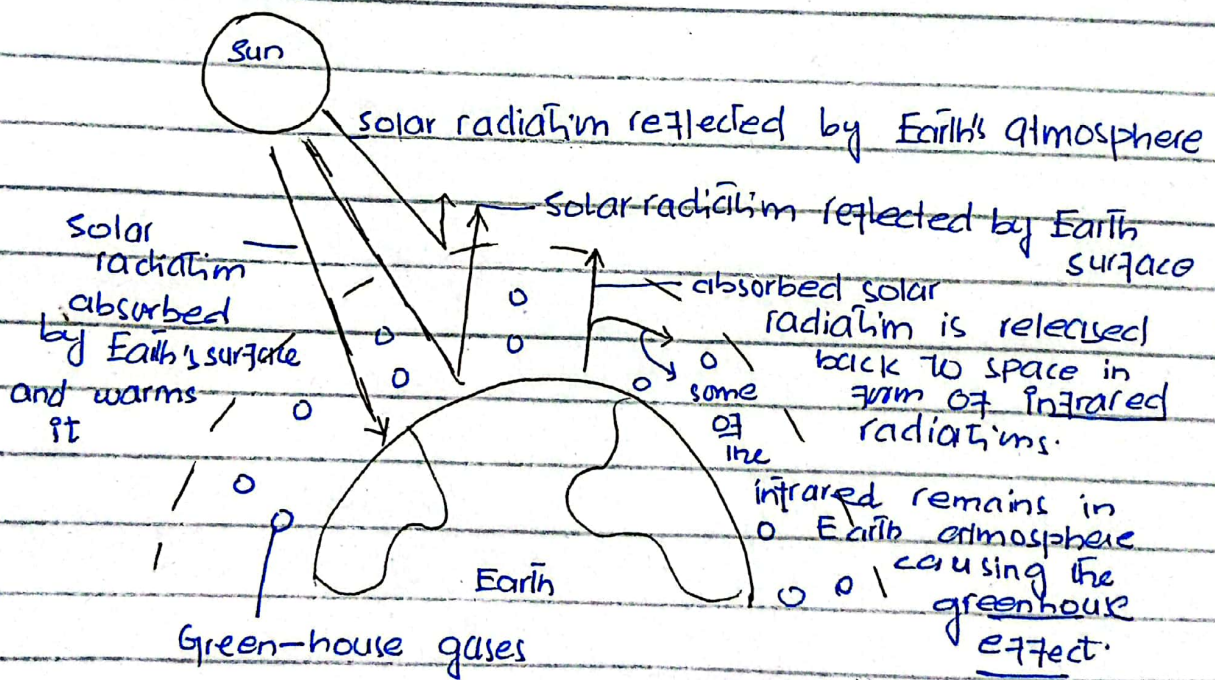
Solution :

- Emission control methods → sorbent injection
→ flue gas desulfurization
- Reduced use of coal.

8) What is the green house effect? Explain how it contributes to global warming.

Greenhouse Effect

Green house effect is a process in which heat-trapping gases insulate the Earth from losing heat, raising the planet's temperature. Without these gases the heat coming to earth will be reflected back leaving the Earth with an inhospitable temperature of -19°C instead of the present average temperature of 15°C .



Greenhouse Gases

Greenhouse gases are those gases contributing to the greenhouse effect. Major greenhouse gases include Carbon dioxide, methane and Nitrous oxide. They have both natural and anthropogenic sources.

Atmospheric lifetime of a gas indicates how long the gas remains in the atmosphere and Global Warming potential (GWP) is the warming effect of the gas.

Following are the characteristics of such gases:

Greenhouse Gas	Formula	Atmospheric Lifetime	GWP
1) Carbon di Oxide	CO_2	100 years	1 year !
2) methane	CH_4	12 years	25 years
3) Nitrous oxide	N_2O	114 years	298 years

This indicates that carbon ^{dioxide} takes 100 years to perish while contributes to warming within only one year.

How the greenhouse effect contributes to Global warming

The greenhouse effect contributes to global warming when there is an increase in greenhouse gases causing the Earth's temperature to rise abnormally. This is called enhanced greenhouse effect which instead of being useful is harmful for the Earth.

Effect of carbon dioxide

Carbon dioxide is responsible for 53% of the level of global warming. It is the result of processes of fuel use, deforestation and cement industry including other uses.

Effect of methane

methane is the next of greenhouse gases which contributes to 15% of global warming. It is generated by activities such as livestock production, agriculture especially rice paddies, sewage, and natural gas.

Effects of halogenated compounds

They are responsible for 11% of global warming and include CFCs, HCFCs, HFCs, PFCs, SF₆, and NF₃. They are generated as a result of diverse sectors such as refrigeration

and air conditioning, electrical and electronic equipment, metallurgy and so on.

Effect of Tropospheric Ozone

It also contributes to around 11% in global warming. It is a product of reaction between carbon monoxide, nitrogen dioxide, and volatile organic compounds, as a result of fuel burning.

Effect of Nitrous Oxide

At 11% contribution to global warming, nitrous oxide is another greenhouse gas. It mainly comes from the use of fertilizers, fuel use, sewage and chemical production.

How is Pakistan Affected by Climate Change?

~~Climate~~ Pakistan contributes very little to climate change but has been vastly affected in the form of glacial melt causing glacial lake outbursts and floods, droughts, desertification.

Controlling Climate Change / Global Warming

Some initiative such as use of renewable energy, adopting the 3R Strategy (Reduce, Reuse, Recycle), reducing deforestation and minimal use of fossil fuels can help reduce global warming and greenhouse effect.

a) Discuss the impact of water pollution on human health and ecosystems. Give examples of major water pollutants and their sources.

Water pollution refers to any change or modification in the physical, chemical and biological properties of water that shall have harmful effects on living things.

Two-third of Earth is covered with water. It is in the form of lakes, rivers, oceans, aquifers and glaciers. Of these only 0.3% is accessible to human consumption.

Sources of water pollution

The key causative of water pollution are:

- o Urbanization
- o Deforestation
- o Industrial effluents
- o Use of detergents and fertilizers.
- o Agricultural run-offs: insecticides, pesticides.
- o Domestic sink and sewage waste.

Effects of water pollution on human health

Polluted water impacts human health adversely. This can be manifested in:

Liver and kidney failure

Chemical contaminants such as MTBE and chlorinated solvents have been linked

with organ damage. polluted water with these chemicals cause liver inflammation, renal failure, and formation of kidney stones.

Arsenicosis

Arsenic-contaminated water cause arsenic poisoning - arsenicosis. It happens with prolonged ingestion of the chemical and can lead to cancers of skin, lungs and kidneys. Millions of people around the world are affected by its poisoning.

Lead poisoning

Lead poisoning happens when traces of lead are ingested through water due to old pipes or other chemicals causing anaemia, high BP, and reproductive disorders. 10% of population have it).

Intestinal worms (10% of population have it). Parasitic worms such as hookworms, roundworm, whipworm and helminths are its examples. They cause stunted growth, anaemia and malnutrition.

Schistosomiasis

Caused by parasitic worms, they harm the intestines, bladder, and liver.

Diarrhoea

It is the most prevalent disease caused by water pollution. There are 1.7 billion cases of childhood diarrhoea every year (WHO).

Impacts of water pollution on ecosystem

Water pollution affects the ecosystem in the following ways:

1) Eutrophication

Agricultural run-off including nutrients like ammonia and phosphate promote rapid growth of algal blooms. They block sunlight and suck up all the oxygen of water for aquatic organisms rendering them dead.

2) plastic ingestion

There are over five trillion tons of plastic in the ^{water bodies} ~~water~~ globally. They breakdown into microplastics which are ingested by marine and aquatic animals putting their lives at risk.

3) Bioaccumulation

Harmful chemicals enter their way into plants and animals pass on to the food chains affecting other animals and humans as well.

4) Acidification

Oceans absorb as much as 31% of CO₂ emissions (NOAA), leading to decreased pH levels. It disrupts marine life especially being a realm of coral bleaching.

5) Loss of entire species

Species extinction is an irreversible damage to the earth. Water pollution puts the world at such risks.

Water pollutants, Their sources and Effects

1) Organic matter

Sources: Industrial waste & domestic sewage

Effects: depletion of oxygen affecting aquatic life.

2) pathogens

Sources: Domestic sewage, animal faeces

Effects: infectious diseases, diarrhoea

3) Nutrients

Sources: Agricultural run-off

Effects: Eutrophication

4) Heavy metals

Sources: Industries, mining sites

Effects: organ failure, cancer, harm to water life.

5) Inorganic compounds E.g. Sulphure, Pm, NO_x.

Sources: electricity generation, mines sites.

Effects: Acidification, toxic water for health.

Minimizing water pollution

- proper disposal of ^{TOXIC} chemicals
- Implementing renewable energy sources
- using ecofriendly chemicals
- Filters in industries for toxic fumes
- The 3R strategy: Reduce, Recycle, Reuse.

10) Explain the concept of drinking water quality standards. Why are these standards necessary?

Drinking water quality standards describe the quality parameters set for drinking water. These parameters vary from country to country.

Pakistan Environmental Protection Agency gave guidelines in 2008 in National Standards for Quality Drinking Water (NSQDW).

Similarly, WHO set up Guideline for Drinking-water Quality (GDWG) in 1993.

Standards for quality drinking water

Comparing the guidelines of WHO and Pakistan upon various parameters:

Bacterial

Parameter	Pakistan's standards	WHO standards.
E. coli	must not be detectable in 100 ml sample	same
Coliform	same	same

Physical

Parameter	Pakistan's standard	WHO standard
Color	≤ 15 true color units	same
Taste	Acceptable / Non ob.	Acceptable
Turbidity	< 5 NTU	< 5 NTU
Odour	Non objectionable	Non objectionable
pH	6.5 - 8.5	6.5 - 8.5

Chemical

Parameter	Pakistani Standards	WHO standards
Arsenic	< 0.05 mg/L (Similar to Asian Developing countries)	< 0.01 mg/L
Chloride	< 250 mg/L	< 250 mg/L

Toxic Inorganic

Parameter	Pakistani Standards	WHO standards
Cyanide	< 0.05 mg/L	< 0.07 mg/L
Lead	< 0.05 mg/L	< 0.01 mg/L
Mercury	< 0.001 mg/L	< 0.001 mg/L

Safe drinking water in Pakistan

A report by Pakistan Council of Research in Water Resources (PCRWR) in 2021 gave the following revelations:

- 31% of the monitored water were safe for drinking
- 71% of water ~~was~~ in Islamabad was safe.
- Lahore showed 69% of safe drinking water.
- 50% of the drinking water in Peshawar was safe for drinking.
- 35% in Balochistan ^{Quetta,} was safe for drinking.
- Karachi's only 7% was safe for drinking.

Why are these standards necessary?

The primary objectives of these standards are to protect public health, preserve ecosystems, and maintain the quality of water sources.

1) Protecting public health

By regulating contaminants such as bacteria, heavy metals and chemicals, these standards help prevent waterborne diseases.

Compliance with these standards help prevent the occurrence of illness, gastrointestinal disorders, hepatitis and certain types of cancers.

2) Environmental Impact

The significance of quality water standards extend beyond human health, saving ecosystems and safeguarding biodiversity.

3) Economic Considerations

By ensuring clean and safe water, these standards contribute to reducing healthcare costs associated with waterborne diseases.

Moreover, communities relying on water-dependent industries such as agriculture and tourism can face major setbacks in case of unsafe water.

Recommendations to enhance and maintain standards of quality drinking water by NSQDW:

- 1) Standard examination of water (ASTM, ISO, etc) specified and made available.
- 2) Public awareness of their responsibility towards establishment and maintenance of drinking quality water.
- 3) Low cost measures to be applied at household level, such as, use of lemon juice and chlorination.
- 4) Supplying quality water to all consumers equitably at reasonably affordable cost.
- 5) Increased quantity along with quality for water scarce areas such as Balochistan.
- 6) Contingency plans for water access in face of disasters especially in areas like ATK and KPK. — Emergency preparedness and response mechanism.