FUELS FROM PETROLEUM INDUSTRY

BY ANJANA PS

PETROLEUM

- Greek:petra=rock,Latin:oleum=oil
- Dark viscous oily liquid
- Occurring deep below earth’s crust entrapped under rocky strata.
- Complex mixture of hydrocarbon including alkanes and cycloalkanes along with some unsaturated hydrocarbons,aromatic hydrocarbons and small quantities of nitrogen,Sulphur,oxygen compounds.
- Exact composition varies with place of orgin.

NATURAL GAS

- Gaseous mixture
- Occurs a cover of gaseous mixture over the petroleum deposit occurring below the rocky strata.
- Consists of mainly low boiling Alkanes, the chief constituent (60-90%)being methane(along with some ethane,propane,butane,etc and some other gases such as CO2, H2s,N^2).
- Used as a domestic fuel and also as an automobile(CNG is compressed natural gas)

REFINING OF PETROLEUM-PETROLEUM DISTILLATION

- Since petroleum contain thousand of hydrocarbons separation of the pure compounds is not feasible or even necessary.
- The crude petroleum, called crude oil is obtained from oil wells is subjected to fractional Distillation to remove associated impurities and to get various useful fractions.
- Fraction obtained from Distillation of petroleum are still mixtures of hundreds of hydrocarbons and are called petroleum fractions.
- The process of removal of undesirable impurities and the separation of petroleum into different useful fractions by fractional Distillation is called refing of petroleum

The different fractions obtained are, in fact, refractionated ... to get various products. Some of the chief fractions and their approximate composition, along with their boiling ranges and uses, are given in Table 7.1.

Table 7.1: Fractions obtained from petroleum distillation

No.	Name of fraction	Approximate composition	Boiling range	Uses
1	Petroleum gas (Gaseous hydrocarbons)	C_1 to C_4	Up to 30°C	As fuel gas, in the production of carbon black and H_2.
2	Crude naphtha Refractionated into the following fractions:	C_5 to C_{10}	30–150°C	
	(a) Petroleum ether	C_5 to C_7	30–70°C	As a solvent for rubber, fats, oils, varnishes, etc. and in the laboratory.
	(b) Gasoline or Petrol	C_7 to C_9	70–120°C	As an automobile fuel, for dry cleaning.
	(c) Benzine	C_9 to C_{10}	120–150°C	For dry cleaning
3	Kerosene oil	C_{11} to C_{15}	150–300°C	As a fuel in stoves, for making oil gas, as illuminant.
4	Diesel oil or Fuel oil or Heavy oil	C_{16} to C_{20}	300–350°C	As a fuel in diesel engines (trains, automobiles and tractors), electric generators and thermal power plants, for the production of gasoline

5	Lubricating oil	C_{21} to C_{24}	350–400°C	For lubrication
6	Paraffin wax	C_{25} to C_{29}	Above 400°C (Cooling gives solid wax with m.p ~50-55°C)	For making candles, ointments, waxed papers, varnishes, paints, and toilet soaps.
7	Asphalt, pitch, petroleum coke, bitumen	C_{30} and up	(Black tarry residue)	For water proofing, in paints, for road surfacing.

THANK YOU

CHEMISTRY PRESENTATION

Topic- Water Pollution

Presented by Kalathinkal Sojiya Joy

WATER POLLUTION

Pollutants of water and their toxic effects

1. Water Pollution by sewage
2. Water pollution by industrial effluents

1. Water pollution by sewage

Sewage- organic or inorganic waste matter of the community carried by water.

1% solids:	99% water
70% organic materials:	proteins, carbohydrates, fats, etc
30% inorganic materials:	grit, salts, metals, etc

Domestic sewage:- Toxic effects

Domestic sewage are discharge into nearby water bodies.

Toxic effects:

1. Indues foul odor or stench to water, imparts colour to it and causes turbidity
2. Carrier of several pathogenic microorganisms.
3. Causes dissolved oxygen depletion.
4. Leads to Eutrophication.

Sewage treatment before discharge

Sewage treatment process involves various steps:

1. Primary treatment : removes settleable solids physically or chemically.
2. Secondary or Biological treatment: aerobic and anaerobic microorganisms removes organic matter.

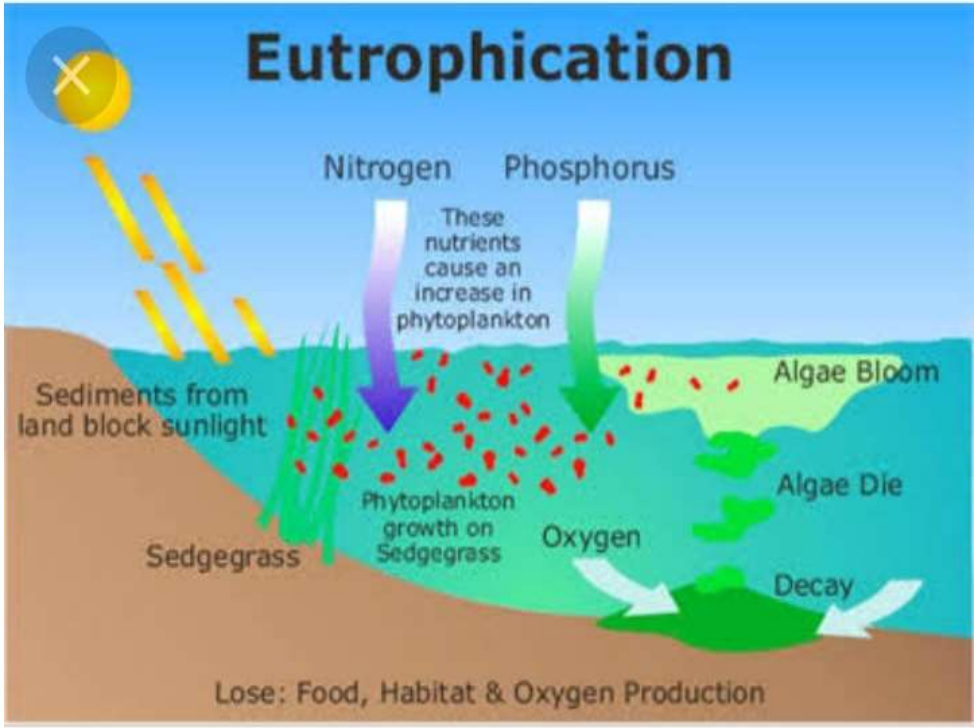
2. Water Pollution by industrial effluent

Industrial effluents discharged into fresh water bodies have the greatest potential to pollute water.

Industrial effluents: simple nutrients, organic matter and complex substances

Industrial effluents:- Toxic effects

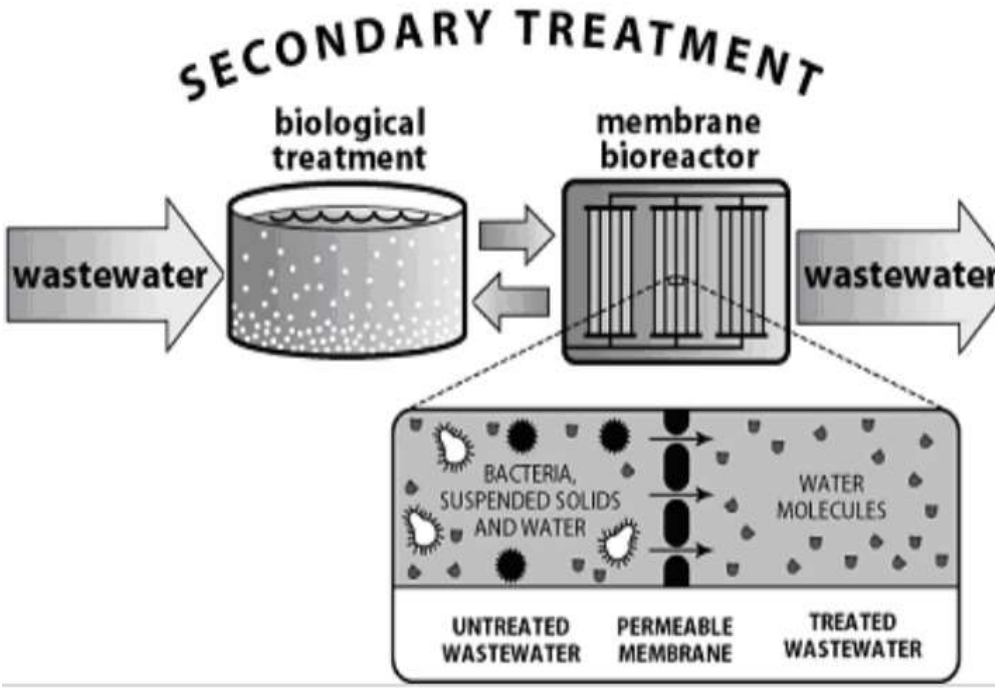
1. Causes oxygen depletion and are highly poisonous to aquatic and terrestrial living organisms.
2. Causes Eutrophication
3. Metal plating Industries effluents are extremely toxic to all organisms
4. Chemical industries effluents make water corrosive
5. Paper mills release effluents are highly poisonous and carcinogenic
6. Radioactive effluents cause radiation pollution.
7. Tanneries wastes contain pathogenic bacteria.



Industrial effluents treatment

Industrial effluents treatment involves:

1. Primary and Chemical treatment- neutralization coagulation, oxidation, etc
2. Secondary treatment uses microorganisms.
3. Tertiary treatment - advanced biological, chemical and physical methods and recycling.




FOOD COLOURS

Food colours or food colourants are coloured substances added to food during or after its processing to impart a colour, the purpose of which may be to maintain, restore or improve its appearance.

- Permitted colours
- Non -permitted food colours

Only those colours that have been approved for safe use after stringent evaluation regarding their safety by the concerned Government Agencies of the respective countries can be used as food additives.

Safety limits prescribed by Government Agencies about 200 mg /kg of the finished product, these substance are called permitted colours.

- Natural colourants
- Synthetic colourants

Natural colourants

Pigments derived from natural sources such as vegetables or animals.

- Anatto extract (yellow), from annatto seeds
- Canthaxanthin(violet), a terpenoid from mushroom, algae.
- Caramel (yellow to tan), a complex polysaccharide.
- Beta-carotene(yellow to orange), from carrots and a variety of plants.- curcumin(yellow-brown), from turmeric

- Saffron (a hybrid of orange and yelow) a carotenoid from dried stigma of the Crocus Sativus Linnaeus, a perennial plant.

Svnthetic colourants

These are man made colours. They are intense, less expensive, and easily create a variety of hues with uniformity.

- Fast Green FCF, a green triarylmethane dye.
- Indigo Carmine, a blue indigoid dye.
- Brilliant Blue FCF, a blue triarylmathane dye.
- Sunset Yellow FCF, a yellow azo dye.

Non-permitted food colours

Those colours that are banned from use as food additives on account of their toxic characters are referred to as non - permitted colours.

- Rhodamine B:a red dye

Cause degenerative changes in the liver and kidney.

Retardation of growth and haemolysis of red blood cells.

- Orange II:An orange dye

Cause haematological changes and retardation of growth.

- Metanil Yellow:A yellow dye

Cause degenetative changes in stomach, kidneys and liver as well as in the reproductive system.

- Malachite green :A green dye

Capable of damaging liver, kidney, heart, and spleen as well as causing lesions of skin, eyes, lungs and bones.

- Auramine:a yelow dye

Damage kidney, liver as well as as cause retardation of growth.

▫□Sudan dyes

Sudan I, II, III, IV, a group of red dyes, cause kidneys lesions as well as damage of liver.

ENVIRONMENTAL POLLUTION

INTRO

- The word ‘environment’, derived from Greek, literally means ‘surroundings‘. It includes the surrounding objects, regions, conditions and especially circumstances of life of all living beings.
- Environnment can be defined as the sum total of all social, economic, biological, physical and chemical factors which constitute the surroundings and influence the life of a living organism in its natural habitat.
- Environnmental studies deal with the sum total of all social, economic, biological, physical and chemical interrelations between the living beings and their surroundings.
- 'Environmental Chemistry’deals with the study of chemical phenomena in the environment. It includes the study of the origin, transport, reactions, effects and fates of chemical species in the environment.
- In his attempt to modify the environment and improve the quality of his life, man has interfered constantly with the environment and this has raised very many environmental issues; one of them is Environmental Pollution.

SEGMENTS OF ENVIRONMENT

- The environment consists of the following four segments.

1. ATMOSPHERE : Atmosphere is the protective cover of gases, consisting mainly of N_2 and O_2, along with some CO_2, Ar and O_3 as well as traces of He, Ne, CH_4, etc. It absorbs all the harmful solar radiations and allows only the near UV, near IR and radiofrequency waves to pass through it towards the Earth. It absorbs part of the IR radiation emitted by the sun and also that re-emitted by the Earth, and thereby maintains the thermal balance of the Earth.

2. HYDROSPHERE : Hydrosphere includes all types of water resources — ~97% of Earth's water is in the oceans~2% of it is tied up in the polar ice caps and glaciers, and ~1% of It is available in fresh water bodies like the rivers, lakes, streams, etc. and as ground water.

3. LITHOSPHERE : Lithosphere is the outer mantle of solid Earth, consisting of minerals occurring in the Earth's crust in the form of soil, rocks, etc.

4. BIOSPHERE : Biosphere denotes the realm of living organisms (plants, animals etc) where they live together being dependent on each other and also interact with the other segments of the environment.

ENVIRONMENTAL POLLUTION

POLLUTION AND POLLUTANTS

Environmental pollution is the contamination of any part of our environment, particularly through human activities, by any undesirable substance or factor detrimental to the environment; it means affecting undesirable changes in our surroundings that have harmful effects on plants, animals and human beings.

- Any solid, liquid or gaseous substance present in greater concentration than in natural abundance, or any agent like heat, radiation or noise, produced due to human activities or natural happenings and is ultimately harmful to the environment (and there from to the living systems) is called POLLUTANT.

- In short, a substance or agent or factor which causes environmental pollution is called a POLLUTANT.

TYPES OF POLLUTION

There are various types of environmental pollution and they are classified in different ways; only a few are mentioned here.

One board way of classification is on the basis of the type of environment being polluted — air, water or soil.

1. AIR POLLUTION : Air pollution means the contamination of the air in our atmosphere by undesirable substances by gases or particles of liquids or solids.
2. WATER POLLUTION : Water pollution means the contamination of the water bodies and the ground water by undesirable substances or organisms or agents like heat.
3. SOIL POLLUTION : Soil pollution means the contamination of the soil by any undesirable substance, organism or agent that adversely affects the quality of the soil.

- Certain kinds of pollution are named after the agents or factors that cause them. Eg., Noise pollution, Thermal pollution and radiation pollution are respectively caused by the agents noise, heat and radiation (from radioactive ssubstances.

- Similarly, on the basis of the type of pollutant involved, we may have sulphur dioxide pollution, Fluoride pollution, Carbon monoxide pollution, Smoke pollution, Lead pollution, Mercury pollution, Solid waste pollution, Pesticide pollution, Fertilizer pollution, and so on.

TYPES OF POLLUTANTS

- Pollutants may be Air pollutants, Water pollutants, Soil pollutants, etc. e.g., Gases such as CO, SO2, NO2, etc. are Air pollutants; pesticides, Fertilizers, detergents, etc. are Water pollutants; Metals and their compounds, plastics, fertilizers, pesticides etc. are soil pollutants. It is obvious that the same substance may pollute air, water and soil at the same time.
- Pollutants may broadly be classified also into the following types.

1. DEGRADABLE OR NON-PERSISTENT POLLUTANTS are those which are degradable by natural processess, e.g., discarded vegetables, domestic sewagt, etc.
2. SLOWLY DEGRADABLE OR PERSISTENT POLLUTANTS are those which remain in the environment in an unchanged form for many decades, e.g., pesticides such as dichlorodiphenyltrichloroethane (DDT), plastics, many chemicals, nuclear wastes, etc.
3. NON-DEGRADABLE POLLUTANTS are those that are not broken down by natural processess, e.g., toxic metals like lead, cadmium, mercury, etc.

THE MAJOR REGIONS OF ATMOSPHERE

The protective cover of gases surroundings the earth is called Atmosphere. It extends to about 1600 km above the Earth's surface.

In order to consider atmospheric pollution, it is required to have a basic knowledge about the major regions of the atmosphere, at least about the two regions ——Troposphere & Stratosphere —— existing immediately above the Earth.

The atmosphere has the 5 concentric layers or regions

1. TROPOSPHERE : The lowest region of atmosphere in which living organisms exist is called Troposphere. It extends up to the height of ~8km at the poles and ~18 km near the equator. It's temperature decreases with height. The gases present in it are mainly N2 and O2, a lot of water vapour, some CO2 and Ar, and traces of He, Ne, CH4, etc. It is a turbulent region of air movement and cloud formation.
2. STRATOSPHERE : The region above the troposphere, extending up to a height of ~50 km above sea level, is called Stratosphere. Its temperature ranges from -55°C to 5°C. It contains N2, O2, ozone and some water vapour. The presence of ozone ('Ozone Umbrella') in the stratosphere prevents about 99.5% of the sun's harmful UV radiations from reaching the Earth's surface, thereby protecting the living organism of the Earth from the harmful effects of such radiation.
3. MESOSPHERE : The region above the stratosphere, between 59 and 80 km above sea level, is called Mesosphere. It contains N2, O2, Ozone, etc. It's temperature is very low and drops to about –100°C at a level of 80 km from Earth.

4. IONOSPHERE : The region above Mesosphere up to ~500 km is called Ionosphere. It contains ionized gas molecules (O2, O+, NO+, etc), atoms and free electrons. It's particles reflect the radiowaves signaled from the Earth back to the Earth surface and thus enables the transmission of radio messages around the world.

5. EXOSPHERE : The region above Ionosphere extending up to ~1600 km and merging with space is called Exosphere. It contains atomic hydrogen and helium. It has a very high temperature due to solar energy.

THANK YOU

The main disadvantage of CNG is its low energy density compared with the liquid fuels like gasoline. CNG vehicles therefore require big, bulky fuel tanks; consequently, CNG usage is practical mainly for large vehicles such as buses and trucks.

PHARMACEUTICALS

Introduction

Chemists and biochemists have long been interested in developing methods to fight diseases. Most importantly, remarkable progress has been made in recent years in understanding the chemical reactions that regulate biological processes. This accumulation of knowledge is, in fact, the first line of defense for man against diseases. Thanks to better immunization and nutrition, coupled with prevention and treatment of infectious diseases that could be achieved by making use of such knowledge, the average life expectancy of man has increased steadily during the past few decades. For example, in India, the average life expectancy used to be below 50 years in the

early 1960s; it has steadily climbed to 67.3 years and 69.6 years respectively for males and females by 2015.

With chemistry as the framework, we take a look in this Section at the most important classes of chemicals available to treat diseases — *i.e.*, the *compounds manufactured for use as medicinal drugs* — namely, *pharmaceuticals*.

Drugs

A ***drug*** is a chemical, normally of low molecular mass (~100–500u), which when absorbed into the body of a living organism interacts with macromolecular targets and produces a biological response.

When the biological response of a drug is healing and beneficial, it is called a ***medicine*** and is used in diagnosis, prevention and treatment of disease(s).

A *chemical substance used in the treatment, cure, prevention, or diagnosis of disease or used to otherwise enhance physical and/or mental well-being is called a* ***medicine*** or a ***pharmaceutical drug***.

The treatment of diseases by destroying the *invading organism* without damaging the cells of the host by the use of chemicals is known as *chemotherapy*. In general, the use of chemicals for therapeutic effect is called *chemotherapy*.

Drugs that can be bought in any drug store or general store or supermarket without the prescription of a medical practitioner are called ***over-the-counter drugs***. Aspirin, paracetamol, antacids, most cough syrups, etc. are examples.

Drugs that can be bought only with the prescription of a medical practitioner are called ***prescription drugs***. In general, a prescription drug is one that has potentially dangerous side effects and hence should be used only by people with specific medical problems under a doctor's care. Antibiotics and narcotic analgesics are examples.

Chemical names, generic names and trade names of drugs

Any drug has a chemical name, a generic name and a trade name.

The **chemical name** of a drug is that systematic name for it from which a chemist should be able to write its complete structure.

The systematic chemical names of drugs are often too complicated for normal use. So, each drug generally has a commonly used name which is normally somewhat related to its actual chemical name; such a name for a drug is called its *generic name*.

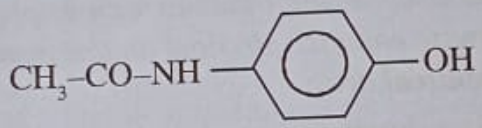
"The **generic name** of a drug is that name which is the generally accepted substitute for its actual chemical name."

Different manufacturers generally use different names for the same drug when they sell it in the market; such names are called the *trade names* for that drug.

"The **trade name** (or **brand name**) of a drug is the manufacturer's name for it in the medicinal market."

Let us illustrate the above naming process with two simple examples.

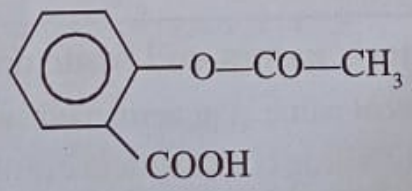
1. *N*-(4-hydroxyphenyl)ethanamide [or *N*-(4-hydroxyphenyl)acetamide], also commonly called 4-acetamidophenol, is a drug widely used for reducing fever (*i.e.*, as an antipyretic) and also for relieving pain (*i.e.*, as an analgesic). *N-(4-hydroxyphenyl)ethanamide* or *4-acetamidophenol* is its chemical name. Its generic name is *paracetamol* (in Britain, India, etc.) or *acetaminophen* (in USA, Japan, etc). Different manufacturers sell it under different trade names. It is sold in India under the trade names Crocin, Calpol, Metacin, Dolo, etc.



Chemical name: *N*-(4-hydroxyphenyl) ethanamide or 4-acetamidophenol
Generic name: Paracetamol or acetaminophen
Trade (brand) names: Crocin, Calpol, Metacin, Dolo, etc.

Fig. 7.1: Paracetamol

2. *2-acetoxybenzoic acid*, also commonly called *acetylsalicylic acid*, is a drug widely used to prevent platelet coagulation (and thereby prevent heart attack, stroke and blood clot). It is also used (though less frequently now a days) to reduce fever, pain and inflammation. *2-acetoxybenzoic acid* or *acetylsalicylic acid* is its chemical name. Its generic name is *aspirin*. It is sold in India under the trade names Aspin, Alpyrin, ASA, Aspidot, Ascad, etc.



Chemical name: 2-acetoxybenzoic acid or acetylsalicylic acid
Generic name: Aspirin
Trade (brand) names: Aspin, Alpyrin, ASA, Aspidot, Ascad, etc.

Fig. 7.2: Aspirin

ENVIRONMENTAL POLLUTION

AIRP POLLUTION BY OXIDES OF NITROGEN.

- The oxides of nitrogen mainly along with some no2 ,n2o ,n2o3 and n2o5 are major air pollutants present in automobile exhaust and effluent gases from electric power industry, fertilizer industry, explosive industry and gold jewellery works.
- No is formed by the high temperature combination of N2 and O2 is slowly oxidized to NO2 and other oxides.
- No although not a major direct health hazard producers. NO2 which is fairly toxic to humans.
- NO2 has an irritating effect on mucus membrane and in higher doses causes severe bronchitis and respiratory problems.

- In a concentration of 3 ppm for 1 hour it causes bronchoconstriction in man and short exposure at 150 to 220 ppm levels produces Fibrotic changes in the lungs with fatal results.
- NO_2 disrupts some cellular enzyme systems. It is a pulmonary irritant and causes pulmonary hemorrhage and pulmonary edema leading to death.
- High levels of NO_2 also cause gum inflammation, pneumonia, internal bleeding and lung cancer.
- Cigarette smoke contains high levels of NO_2 which causes lung diseases and lung cancer to active smokers as well as to passive smokers.

- Oxides of nitrogen involves in various photochemical reaction with hydrocarbon in the atmosphere this give rise to photochemical smog which is characterized by brown hazy fumes which irritate eyes ,nose throat and lungs.
- This smog is a regular feature of some of the major cities of the world.
- Automobile exhaust are the major culprits in the formation of photochemical smog which is also known as the los Angeles type smog in memory of the terrable smog experienced in Los Angeles in 1944.
- Nitrogen oxides also cause the precipitation of nitric acid in the atmosphere and leads to the detrimental phenomenon called acid rain.

Formation of photochemical smog

At high concentrations of the nitrogen oxides, a photochemical chain reaction occurs in which nitric oxide (NO) is converted into nitrogen dioxide (NO_2).

$$2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$$

NO_2, in turn, photochemically decomposes into nitric oxide and free oxygen atom.

$$NO_2(g) \xrightarrow{h\nu} NO(g) + O(g)$$

The reactive oxygen atoms thus produced combine with O_2 to form *ozone*.

$$O(g) + O_2(g) \rightleftharpoons O_3(g)$$

This ozone oxidizes the NO formed in the previous reaction to regenerate brown NO_2 which is a major contributor to the brown haze of the smog.

$$NO(g) + O_3(g) \longrightarrow NO_2(g) + O_2(g)$$

Both NO_2 and O_3 are strong oxidising agents and can react with the unburnt hydrocarbons in the polluted air to produce various chemicals such as *formaldehyde* (HCHO), *acrolein* (CH_2=CH–CH=O) and *peroxyacetyl nitrate* (PAN, CH_3–CO–ONO_2).

e.g., $3CH_4(g) + 2O_3(g) \longrightarrow \underset{\text{Formaldehyde}}{3HCH=O} + 3H_2O$

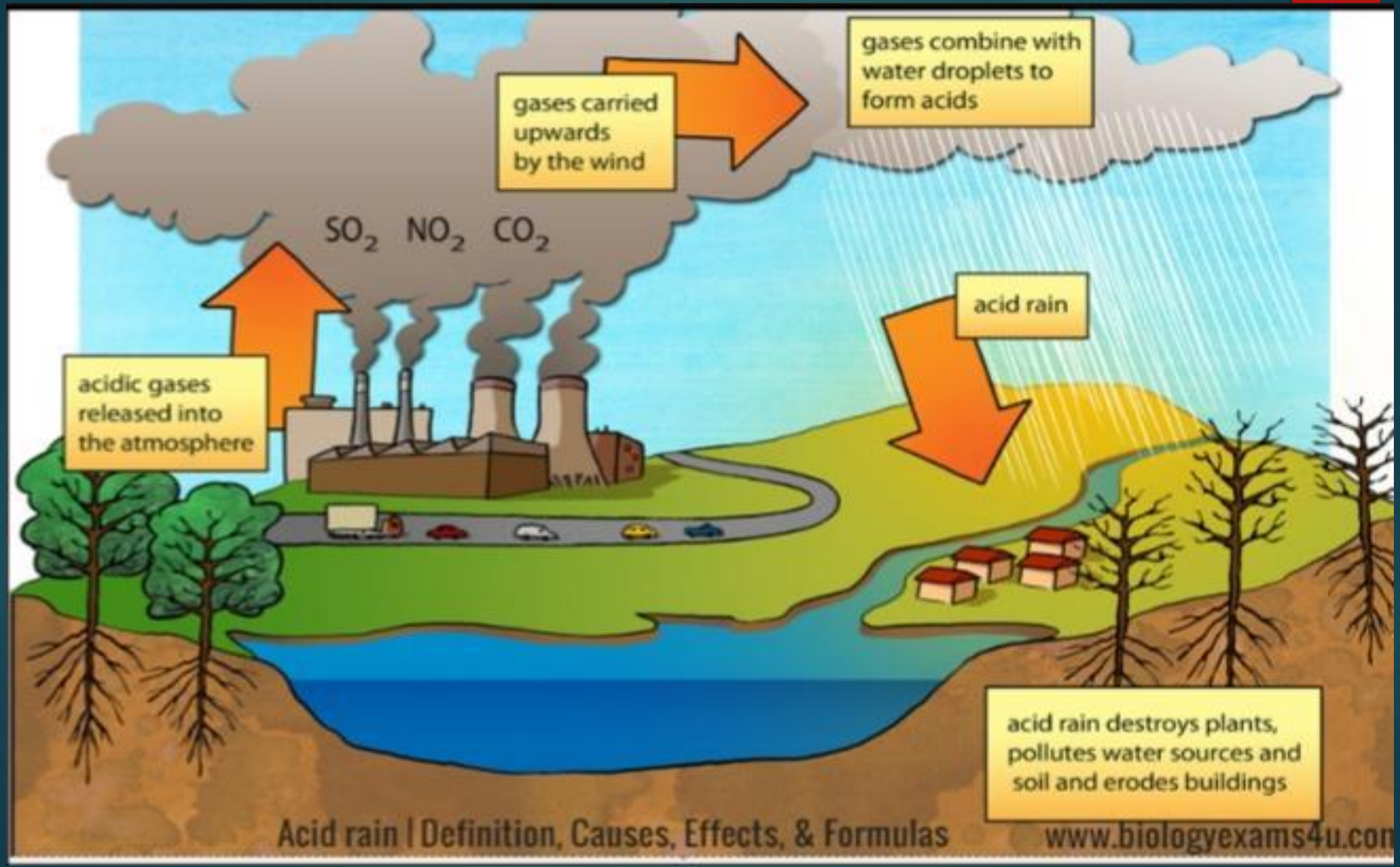
These linger in the atmosphere producing smog.

AIR POLLUTION BY THE OXIDES OF SULPHUR.

- The oxides of sulphur SO2 and so3 are produced as a result of the burning of high sulphur content fuels in thermal power plants and industries.
- so2 and so3 are present in automobile exhaust also.
- Even at very low levels SO2 and so3 cause irritation of eyes and damage the respiratory tract producing cough and chocking in humans.
- Inhalation of SO2 at the level of 5 Ppm for 1 hour can cause construction of the bronchial tubes while inhalation at a level of 10 ppm for 1 hour can coast severe respiratory distress.

- Inhalation of SO2 at higher levels leads to bronchitis emphysema chronic asthma and even cancer.
- Inhalation at very high levels causes death by suffocation.
- SO2 is a major factor which causes the formation of sulphurous smog.
- Not only is it a major irritant of eyes nose throat and lungs but also causes pneumonia bronchitis and allied respiratory problems.
- This is also called London smog in memory of terrible smog that London experienced in December 1952. The smog had then prevailed in the city for 5 days and had cause to the death of 4000 to 5000 inhabitants also making thousands ill.

- Sulphurous smog also called classical smog occurs in cool humid climate and his particularly found in winter mornings in many countries.
- It is a mixture of smoke , fog and Sulphur dioxide.
- Classical smog is chemically a reducing mixture and so it is also called the reducing smog.
- The sulphur oxides cause the precipitation of sulphuric acid in the atmosphere leading to the phenomenon acid rain.
- Which is highly detrimental to living organisms and destroys buildings and sculptures.


gases carried upwards by the wind
gases combine with water droplets to form acids
SO_2 NO_2 CO_2
acidic gases released into the atmosphere
acid rain
acid rain destroys plants, pollutes water sources and soil and erodes buildings
Acid rain | Definition, Causes, Effects, & Formulas
www.biologyexams4u.com

- The sulphur oxides adversely affect plants also.
- They are absorbed through the stomata into the mesophyll of the leaves which inactivate the cells.
- This leads to tissue collapse , bleaching of leaves, dwarfing, stiffness of flower buds and eventual destruction of the plants.

CHEMISTRY IN DAILY LIFE

Glass

- Glass is a transparent material obtained when a complex mixture of highly viscous molten silicates, upon moderately rapidly cooling solidifies to an amorphous Rigid body without crystallisation .
- it is essentially a super cold liquid.
- Upon heating it gradually soft and into a loose mass over a range of temperature and can be moulded or Blown into any desired shape enabling the manufacture of a variety of differently shaped article

hot at the opening and cold towards the end. The temperature of the furnace is adjusted such that it is very cooled gradually at the required optimum rate. The process thus ensures that glass is

Types of glass and their uses

1. **Soda glass:** This glass is also called *soft glass* or *ordinary glass* or *window glass*. It is obtained by fusing together quartz/sand, sodium carbonate and calcium carbonate. Approximate composition is $SiO_2 = 75\%$, $Na_2O = 15\%$, $CaO = 8\%$ and $Al_2O_3 = 2\%$ (present as impurity). This type of glass softens at relatively low temperatures and can hence be easily moulded into desired objects. It is mainly used to make window panes, cheap tableware, reagent bottles, etc. which do not have to withstand very high temperature.

Potash glass: This type of glass is also called *hard glass*. It is obtained by fusing together quartz/sand, potassium carbonate and calcium carbonate. It has a higher melting point and hence is able to withstand higher temperatures than soda glass. So, it is used for combustion tubes and chemical glassware.

Flint glass: This type of glass is obtained by fusing together mainly quartz/sand and lead carbonate, along with some sodium carbonate, potassium carbonate, and calcium carbonate. Approximate composition is $SiO_2 = 45\%$, $PbO = 44\%$ $Na_2O = 4\%$, $K_2O = 4\%$, $CaO = 3\%$. It is a heavy and durable glass characterized by its brilliance, clarity, high refractive index and high transparency. Therefore, it is used for making optical instruments like lenses and prisms, artificial diamonds and other imitation gems. Since it absorbs most UV light, but comparatively little visible light, it is also used for telescope lenses.

Pyrex glass: This is a *borosilicate glass*, which contains B_2O_3 as one of the ingredients. It is obtained by fusing together mainly quartz/sand, sodium carbonate, aluminium oxide and boric oxide. Approximate composition is $SiO_2 = 80\%$, $B_2O_3 = 12\%$, $Na_2O = 4\%$, $Al_2O_3 = 3\%$, $K_2O = 0.5\%$, $CaO = 0.5\%$. It has very low coefficient of thermal expansion and is able to withstand large temperature changes. Therefore, it is used for making laboratory glassware and cookware that can be heated to high temperature.

Jena glass

- This glass was the forerunner of pyrex glass and is a Boro silicate class obtained by fussing Silica with sodium magnesium aluminium and zinc oxides as well as some Boron trioxide.
- it is a fine quality glass with improved resistance to heat and shock as well as to Chemicals.
- it is used for making thermometers me sharing message optical ware etc.

Crookes glass

- 21 Glass that contains also Phosphorus and lead oxides along with some cerium oxide.

It is a soft s glass with low melting point and capable of absorbing uv radiations.

- it is used for making lenses of spectacles and other optical instruments.

- Thank you

ANTIBIOTICS

- Many microorganisms

Produce certain chemical which inhibit the growth or metabolism of some other disease causing

Microorganisms.many of these can be made partly or completely by synthesis too.

Such chemical compounds are Known as antibiotics.it helps the immune system by either destroying invaders or preventing their multiplication.

- Ampicillin and amoxycillin are antibiotics that are synthetic modification of pencillin
- Eg:- Tetracyline,ciproflaxcin,aminoglycosides

Antacids

- The drugs that provide relief from the ailment symptoms of hyperacidity are known as Antacids. The most common ingredients in antacids drugs available are Hydrogen carbonate,calcium carbonate , magnesium hydroxide.etc Often in combination with other drugs like simethicone to help breakdown gas bubbles in your stomach .The antacid are available in tablets and syrup forms.These drugs neutralise excess acid in the stomach and raise pH to appropriate level.

Some Antacids are:-

- Cimetidine
- Ranitidine
- Omeprazole
- Oesmoperazole
- Rabeperazole

- The walls of human stomach contains thousands of cells that secrete HCl acid.The main purpose of which are to kill Microorganisms and to acid digestion.
- Hyperacidity is the condition in which the level of acid in gastric juice is excessive causing discomfort.it also leads to ulcers in stomach.

Antiseptics

- Chemicals which are used to prevent the growth of or kill Microorganisms are called antiseptics.They are not harmful to living tissues and hence can be safely applied on cuts,wounds, ulcers etc.

Some familiar examples

- Dettol is an antiseptic ,it is a mixture of chloroxylenol and terpineol
- Bithional is added to soaps to impart antiseptic properties.
- Iodine is a power ful antiseptic,it's 2-3% solution in alcohol water mixture is known as tincture of iodine.it is applied on wounds.
- Boric acid in dilute aq solution is a weak antiseptic for eyes.

CETANE NUMBER

The cetane number or cetane rating is an arbitrary scale for rating the relative ignition properties of diesel oil samples when they are used in a standard test engine.

- **Diesal engines function differently from petrol engines.**
- **In a petrol engine, the air fuel mixture is compressed upto about 1/8 th to 1/12 th of its original volume and then ignited by means of a spark(from a spark plug).**
- **Unlike gasoline engines, a diesel engine has no spark plug to bring about ignition. They use high compression of air (upto about $1/14^{th}$ to $1/25^{th}$ of its original volume). To generate the high temperatures required for auto ignition of the fuel.**
- **In this respect, among the diesel oil range (C16 to C 20) of hydrocarbons, it has been found that straight – chain hydrocarbons are better fuels than branched- chain, alicyclic and aromatic hydrocarbons.**

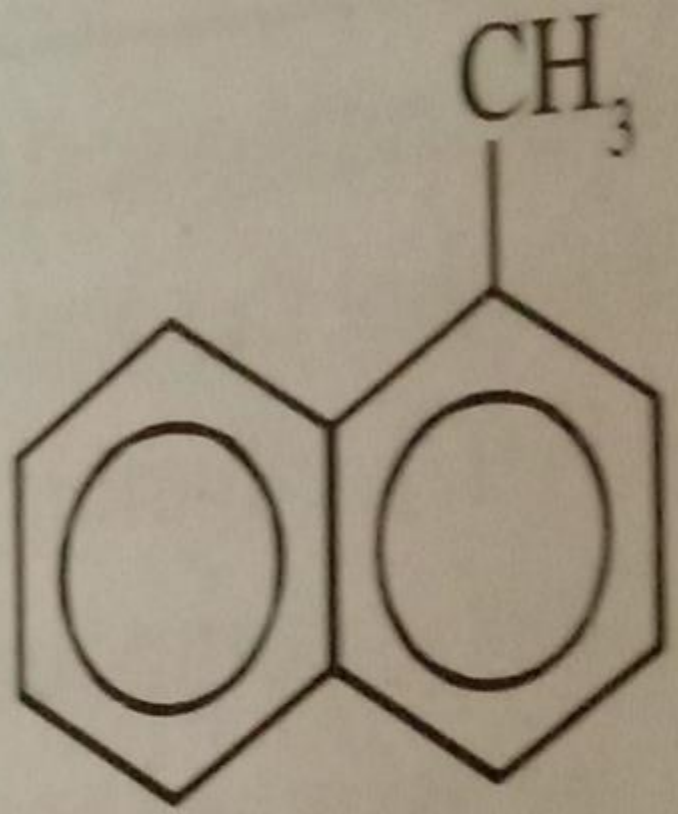
- The straight chain alkane *hexadecane (common name: n-hexadecane or cetane)*

And the aromatic hydrocarbon 1-*methylnaphthalene(common name:alpha methylnaphthalene), are taken as the standards for the purpose of cetane rating. Cetane which ignites rapidly is assigned a cetane number of 100 while alpha-methylnaphthalene which iginites slowly is assigned a cetane number of zero.*

thylnaphthalene which ig

$CH_3(CH_2)_{14}CH_3$

Hexadecane
(*n*-Hexadecane)
Cetane no. = 100



1–Methylnaphthalene
(α -Methylnaphthalene)
Cetane no. = 0

“The cetane number or cetane rating of a sample of diesel is defined as the percentage of cetane present in a mixture of cetane and alpha-methylnaphthalene which has the same ignition characteristics as the fuel sample under consideration when examined in the test engine under the same conditions.“

- Thus, if a diesel oil sample has the same ignition characteristics as a mixture of 46% cetane and 54% alpha- methylnaphthalene, it is assigned a cetane number of 46.This is generally the cetane number for regular diesel fuels at present.

- The higher the cetane number of diesel fuels, the better is the ignition characteristic of the fuel. Premium diesel fuels Containing additives known as cetane enhancers (eg. 2 – ethyl hexyl nitrate) can have a cetane number as high as 60.


WATER
QUALITY
PARAMETERS

- **Physical, chemical, microbial analysis** - Essential
- Usually expressed in:- **colour, taste, turbidity, pH, salinity, electrical conductivity, etc..**

Three of the parameters commonly used to express water quality

- **Dissolved oxygen**
- **Biochemical oxygen demand**
- **Chemical oxygen demand**

) DISSOLVED OXYGEN (D.O)

- *Fundamental requirement for maintenance of life for aquatic population.*
- *Important parameter of :- Extent of water purity or The extent of population associated with it.*

- In most waters, varying concentrations of dissolved oxygen are found.
- Because the amount depends upon the solubility of oxygen in each type of water.

- It is influenced by temperature, pressure, salinity etc…
- D.O is expressed as the weight of oxygen in milligrams present per litre of water or as parts per million.
- The optimum value of D.O for good water quality is 4-6 mg/L.

- Oxygen demanding substance present in water, their oxidation by micro organisms consumes the D.O and its level falls
- D.O level falls below critical value indicates **pollution of water**

DETERMINATION OF D.O

- Usually determined iodometrically.
- D.O react with KI, liberate I
- Which then titrated with standard sodium thiosulphate solution.

- D.O 1st treated with Mn^{2+}, precipitate MnO_2
- Then estimated iodometrically in acid medium.

2) BIOCHEMICAL OXYGEN DEMAND

- B.O.D of a sample of water is the amount of dissolved oxygen used up by suitable aquatic microorganisms for the oxidation of organic matter present in a well-aerated sample of water incubated

- It is usually expressed in mg of oxygen /litre or as parts per million.
- For pure water B.O.D value is 1-3mg/L
- Higher B.O.D value indicates pollution.

DETERMINATION OF B.O.D

- It is determined by finding out the amount of D.O in it before and after its incubation for 5 days in the dark at 20°C.The difference between initial and final values is the actual B.OD

- Before incubating the sample, it is well aerated to ensure that oxygen is present throughout the period of incubation.
- In domestic waste water or surface waters, microorganisms will be sufficiently present, but if the sample is deficient in microorganisms, they have to to introduced before incubation.

- This is usually done by adding settled domestic waste water stored for 24-36 hours at 20°C
- B.O.D test is empirical and semi-quantitative although the result could be considered as an indication of the quality of water source.

- The selection of microorganisms used as seed is very important and the results are often not reproducible.

3) CHEMICAL OXYGEN DEMAND

- C.O.D is the amount of oxygen used for the oxidation of organic matter in water determined with help of a strong chemical oxidant, usually potassium dichromate in acid

- C.O.D is useful for waste water studies
- C.O.D value is always higher than B.O.D value
- Any C.O.D value higher than

  250 ppm is regarded as indicative of pollution

- COD test involves boiling the water sample for two hours with excess of standard potassium dichromate in presence of sulphuric acid.
- The unreacted potassium dichromate is then determined by titration against standard ferrous ammonium sulphate.

- And the oxygen equivalent of the reacted dichromate calculated

Thank you

Flash point

The flash point of a particular liquid fuel is the minimum temperature at which it gives off enough flammable vapour to ignite in air giving a flash, when an ignition source is brought near its surface.

The flash point of a sample of fuel depends upon the proportion of volatile hydrocarbons present in it.

Whether a fuel is flammable or not at a certain temperature is determined by its vapour pressure or volatility.

In order to prevent fire-hazard, it is important that a fuel should not be too volatile

Government of each country fixes a certain temperature below which the oil must not give sufficient vapours to form an explosive mixture with air, this temperature is called flash point.

LPG

Liquefied petroleum gas

Liquefied at 15° c and pressure 1.7-7.5bar

Stored in steel cylinders

By-product of natural gas processing, petroleum refining& petroleum cracking.

Components :hydrocarbons containing three or four carbon atoms, mainly propane, butane.

A sulphur- based odourant added to facilitate leak detection.

Uses of LPG:

1) as a domestic fuel for cooking and heating purposes,

2) in scientific laboratories for heating purposes. 3) as an automobile fuel (as it is more energy efficient, is cheaper, and causes

much less pollution than other fuels like gasoline or diesel).
4) as a fuel for heating purposes in industry (e.g paper and food-processing
industries),

5) as a refrigerant.

CNG

CNG is compressed natural gas (compressed to about 1% of the original volume), stored in high-pressure tanks at 200-250 atm. It is produced using the natural gas drawn from gas wells or oil wells in conjunction with crude oil production.

CNG consists mainly (60-90%) methane along with some ethane, propane, butane, etc. And some other gases such as CO_2, H_2S, N_2, etc.. A sulphur-based odourant (like a mercaptan) is normally added to CNG to facilitate leak detection.

Uses

Used as a fuel in automobiles such as buses and trucks. It is also used as a fuel in locomotives.

The main advantage

CNG vehicles emit far less carbon monoxide, Gggggggggggnitrogen oxides (NO), and particulates.

, #less pollution. Further,

unlike LPG, it is lighter than air, minimizing the risk of a fire-hazard upon leakage

The main disadvantage of CNG is its low energy density compared with the liquid fuels like gasoline CNG vehicles **therefore require big, bulky fuel tanks** consequently, CNG usage is practical mainly for large vehicles such as buses and trucks.


Thankyou.....
CNG

CHEMISTRY IN DAILY LIFE

RATING OF FUELS USED IN INTERNAL COMBUSION ENGINES

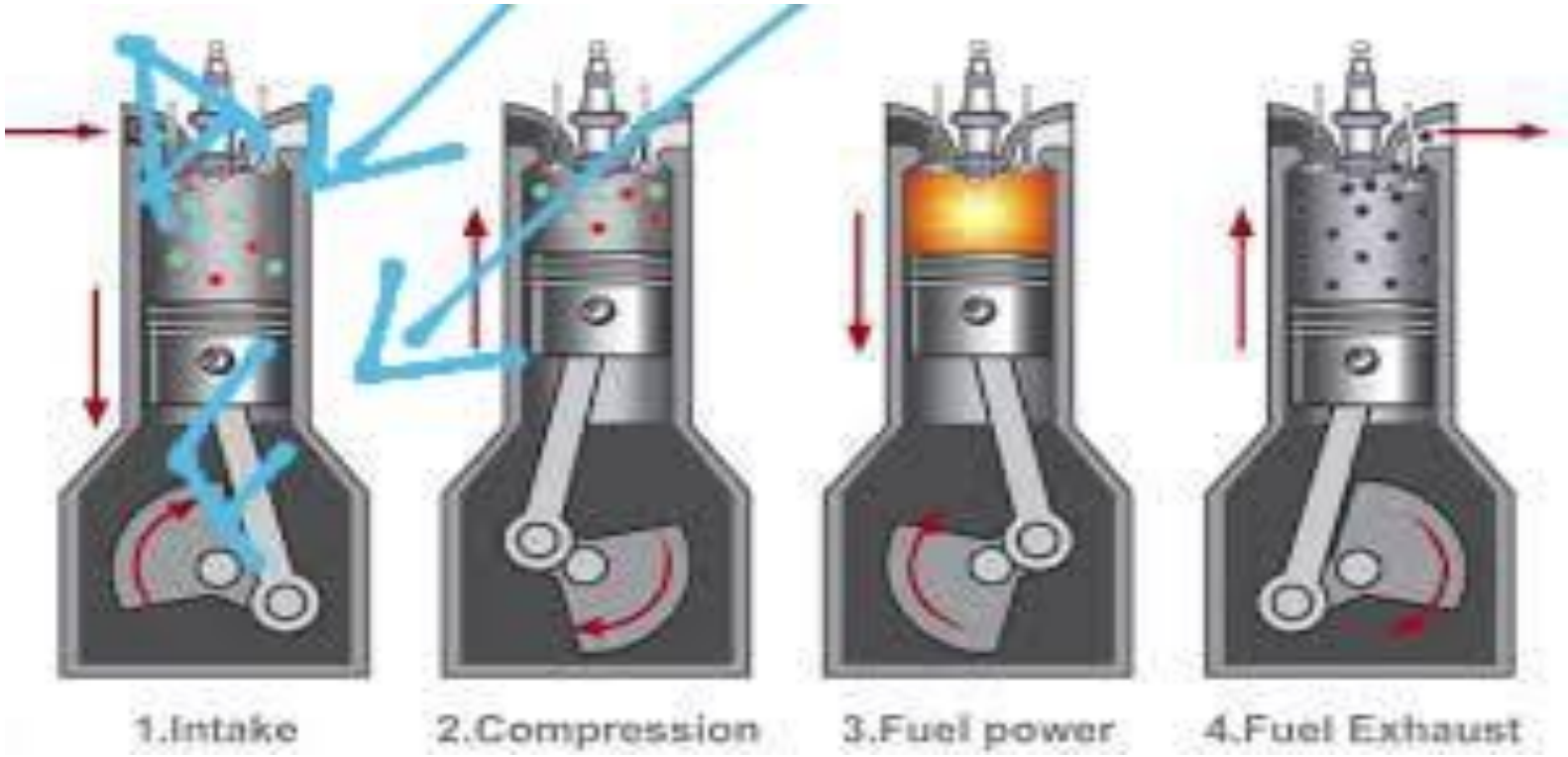
In an internal combustion engine using gasoline as fuel the gaseline air mixtures is first compressed and then ignored by means of spark In the cylinder of the engine.

The products of combustion of keypad a much greater volume than the original gasoline and air and this larger expansion cause the movement of the piston.

Efficiency of of the engine depends upon the compression to which the fuel air mixer is subjected to at the time of combustion the greater the compression the greater is the efficiency.

- But beyond a certain compression limit the mixture burns suddenly and rapidly.
- This Rapid burning causes uncontrolled explosion of the fuel causing a violent jerk against the Piston, as evidenced by a knocking or pinging sound in the engine. This is called a knocking just reduces engine power and may damage the engine.

- The nature of the fuel determines the limiting or critical compression at which knocking ensurence a better fuel has better and the knocking properties


1.Intake
2.Compression
3.Fuel power
4.Fuel Exhaust

- The antiknocking properties of a sample of gasoline are measured in terms of a parameter called Octane number or octane rating.
- Diesel engines utilise diesel oil as fuel but function in a manner different from petrol engines.
- The ignition Qualities of a simple of diesel oil are measure in terms of a parameter called centane number or centane rating

OCTANE NUMBER

- The burning properties of hydrocarbons depend on their structure.
- In fact with regard to the gasoline range (C7 to C9) of hydrocarbons plant chain hydrocarbons have greater and antiknocking properties than straight chain hydrocarbons.
- Octane is an arbitrary scale of rating the relative knocking properties of gasoline when they are used in a standard test engine.
- namely the straight chain alkane heptane and the branched chain alkane 224 trimethyl pentane commonly called isooctane,are taken as the standards.

- Heptane which Knox considerable considerably is assigned an octane number 0.
- 224-trimethylpentane which burns smoothly is assigned an octane number of 100.
- The octane number of a gasoline sample is determined by first using the gasoline in a standard engine and recording its knocking properties.
- The test results are then compared with the behaviour of mixtures of in n heptane and isoctane and the percentage of isooctane in the mixture with identical knocking properties is called the octane number or octane rating of the gasoline.

- Octane number or octane Rating of a sample of gasoline is defined as the percentage of isooctane present in a mixture of n heptane and Isooctane which has the same knocking characteristics as the fuel sample under consideration when examined in the test engine.

- Thus, if a gasoline sample has the same knocking characteristics as a mixture of 13%heptane and87% Isooctane,it is assigned an octane number of87.This is generally the octane number for regular fuels at present.

- The following are the observation in respect of the octane numbers of different types of hydrocarbons :-
- 1) Straight- chain hydrocarbons have rather low octane number. Octane number further decreases with increase in the length of the carbon chain.
- 2) Branched – chain hydrocarbons have higher octane numbers than isomeric straight chain hydrocarbons.
- 3)Alkenes, cyclohexane a and aromatic hydrocarbons have higher octane numbers than branched –chain alkanes.

Antiknock agent

- Addition of certain compounds called octane enhancers to gasoline can increase its octane number. Typical Examples are the antiknock agents.

- An antiknock agent or antiknock compound is a gasoline sample additive used to reduce engine knocking and increase the fuel s octane rating.

- Thank you

SOME CLASSES OF Drugs

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Antipyretics

- Antipyretics are drugs that reduce fever.i.e drugs that reduce the body temperature in fever.
- Example:-paracetamol. chemical name :N-(4-hydroxyphenyl)acetamide.
- It also functions as an anelgesic.(pain-reliver).
- Another typical example for an antibiotic is aspirin. Acetylsalicylic acid.
- * It has analgesic as well as and inflammatory properties too.
- Another example is phenacetin. Chemical name: N-(4-ethoxyphenyl) acetamide.

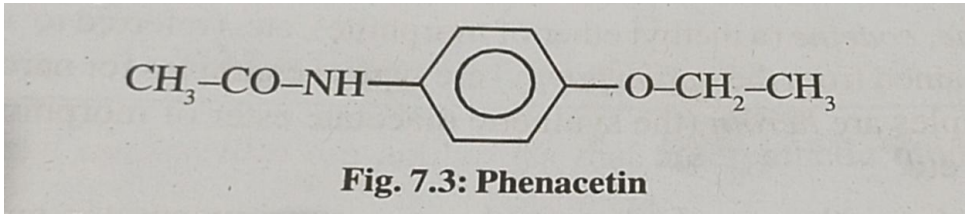


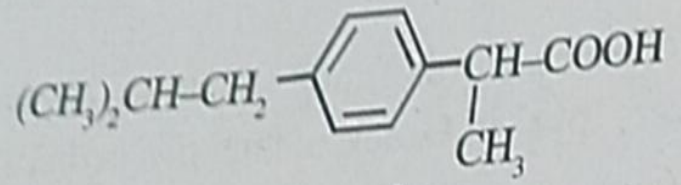
Fig. 7.3: Phenacetin

Antipyretics

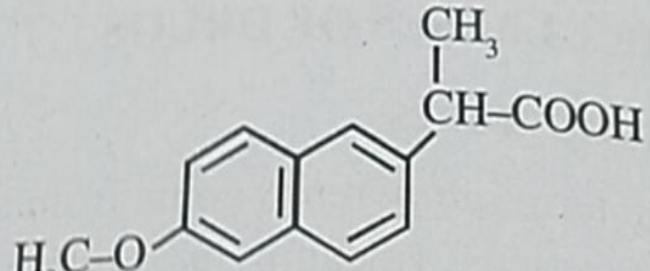
- Other example include ibuprofen, and naproxen as well as the Salicylates like choline Salicylate, magnesium Salicylate and sodium Salicylate. Like aspirin these too have Anti-inflammatory properties and thereby belong to the class of non-steroidal anti-inflammatory drugs.(NSAIDs)

Analgesics

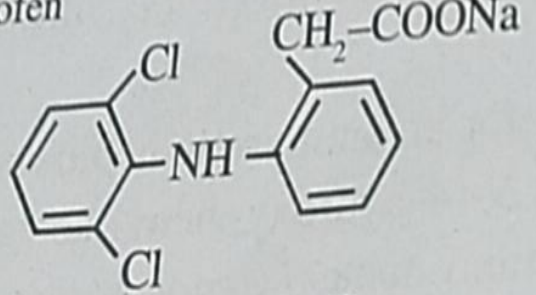
- Analgesics are drugs that relive pain.
- It is classified into non-narcotic(non-addictive) analgesics and narcotic analgesics.
- Non narcotic analgesics.
- These are analgesics that neither produce sleep/unconsciousness nor addiction in any person using them. Paracetamol is the most familiar example
- Aspirin and other non steroidal anti inflammatory drugs including ibuprofen, etoricoxib,diclofenac,aceclofenac and naproxen belong to the class of non-narcotic analgesics.



Ibuprofen



Naproxen



Diclofenac Sodium

Fig. 7.4: Some non-steroidal anti-inflammatory drugs (NSAIDs) which act as analgesics

Narcotic analgesics

- These are the drugs that are potentially addictive which, when administered in medicinal doses, relieve pain and produce sleep. These are mainly used for relief of post-operative pain,cardiac pain,obstetric pain and terminal cancer pain
- Morphine, codeine Etc are typical example for narcotic analgesics.
- In higher doses, these analgesics produce unconsciousness in much higher doses,these produce stupor,coma, seizures and ultimately death.

Thank you