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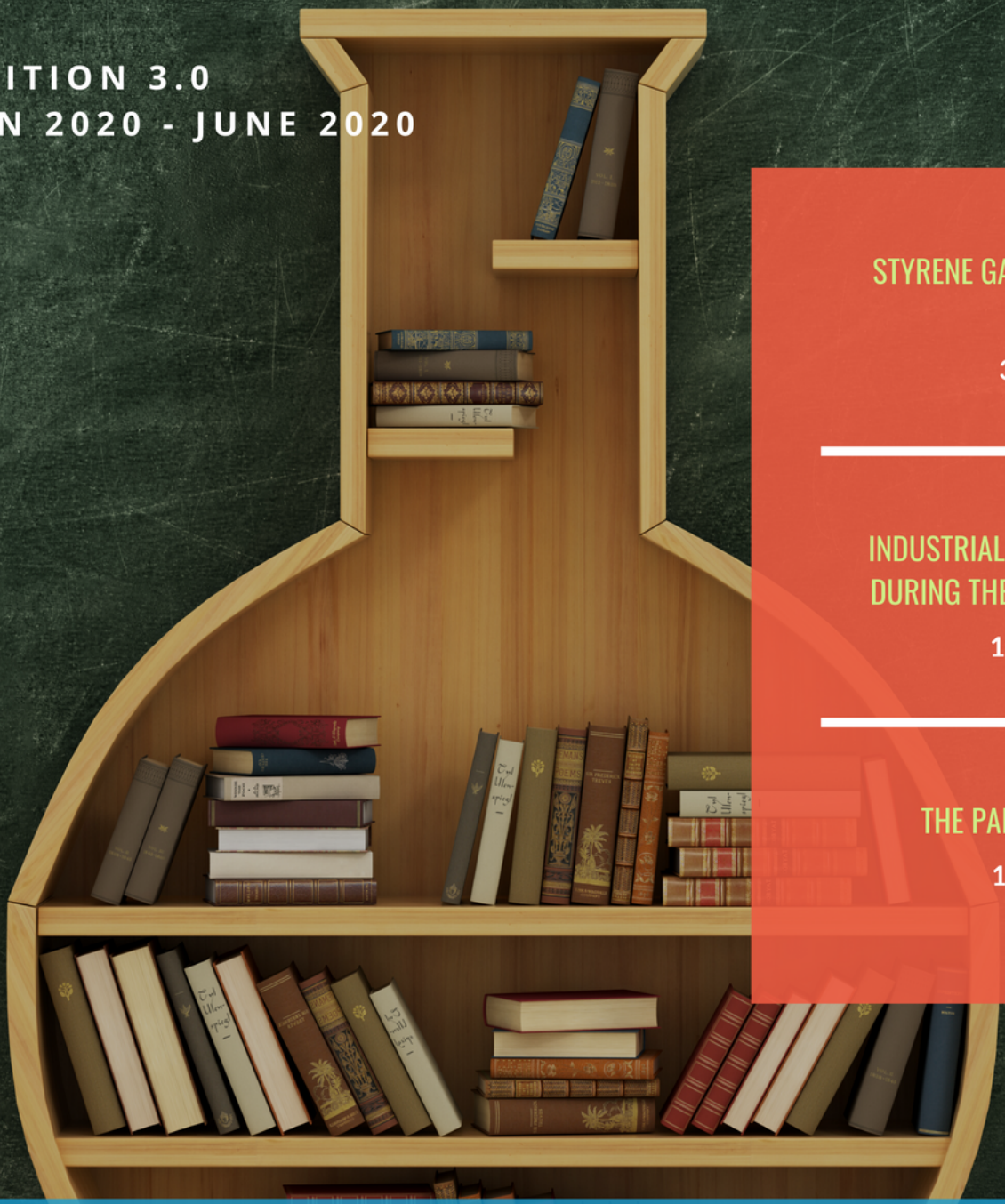


A BI-ANNUAL MAGAZINE BY
IIChE-GVPCE(A) STUDENT CHAPTER
DEPARTMENT OF CHEMICAL ENGINEERING
GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING
(AUTONOMOUS)

Team Ozone

Prathyusha Vedula

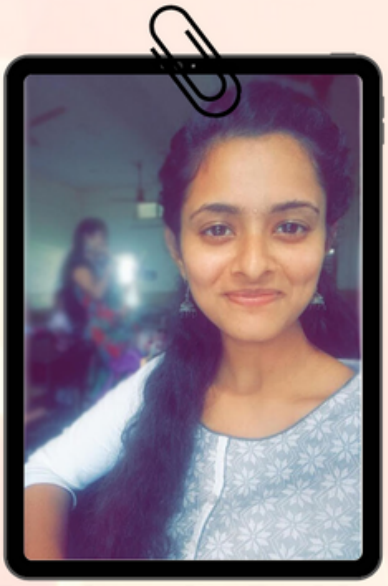
-4 year

Cheif editor and Magazine co-ordinator

Nikhil Binani

-3 year

Article Contributor



Prathyusha Boddeda

-2 year

Article Contributor and design support

Bilwesh Avvari

-3 year

Article Contributor

Sanjana .K

-1 year

Article Contributor

Prasanna

-1 year

Article Contributor

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2019 - 2020

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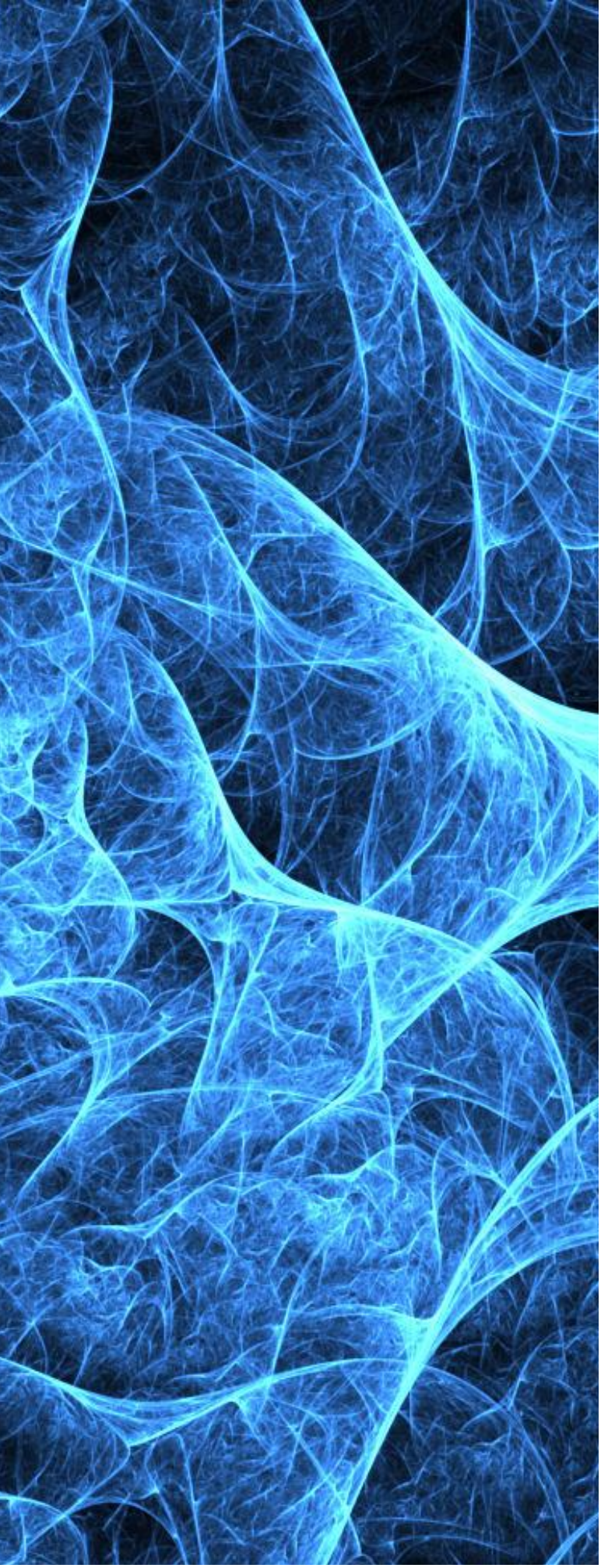


CONTENTS

Rodolph L. Motard

CHEMICAL ENGINEER

CAREER SUMMARY

Rodolphe L. Motard also known as Rudy Motard was a professor of Chemical Engineering and chairman from 1978-1991 of the Chemical
Engineering department in the school of Engineering & Applied Science at Washington
university in St. Louis. He was the one to use application of computer in
chemical process design.

EMBARK TO THE CHEMICAL

Motard earned his bachelor's degree of Chemical Engineering at Queen's university in Canada (1947). He later gained a master's degree and doctorate (1948, 1952) on the subject at Carnegie Mellon university. He started his first job with Shell oil co. in 1951; studying the catalytic cracking of petroleum and helping the design of major commercial refineries.

CHEMICAL ENGINEERING GOES DIGITAL

Motard was first introduced to digital computers in 1956 at the dawn of the computer age. Shortly he became a leader in the application of
computers to chemical process design. In 1957 he joined the university of Houston, both at the department of Chemical Engineering and the university's computer centre. There, he initiated research in computer applications, including process simulation, process dynamics, modelling and process optimization.

FROM CHESS TO THE MODERNCHEMCAD

At the university of Houston he founded the process simulation laboratory and directed the systems engineering program. Motard's computer program chess (chemical engineering simulation system) was being used worldwide to teach chemical engineering design. The program was the basis for a major commercial package in the field of process analysis. The program was adapted to pc in 1985, and was renamed chemcad. Three years later chemstations inc. was founded to continuously develop the program. The program has expanded significantly over the years, up to the most recent version chemcad 6.5.

AICHE FELLOW AND CARTOON INSPIRATION

In June 1992, Motard was named a fellow of the American Institute of Chemical Engineers.Although he had many peer-reviewed publications, he was particularly was proud of a cartoon he had come up with. the cartoon describes a new mathematical technique he had devised to detect corrosion. drawn by larry gonick, the two-page-cartoon appeared in the magazine discover in april 1996.

COMPUTER AIDED CHEMICAL ENGINEERING

Motard was a charter founder of the Cache Corporation, a non-profit association, dedicated to the promotion of digital computation in chemical engineering education. Throughout his teaching career, at the university of Houston and later at the Washington university in St. Louis, he expressed particular interest in the utilization and development of computer applications in the education of young chemical engineers.

Rodolphe L Motard is one of the pioneers who created computer aided process simulation along with Dr. Ernest Henley. Both of them are the fathers of one of the first process analysis tools “chess” in the year 1968 which then later led to the foundation of the modern process simulation software chemcad.

RUDY MOTARD SAID,
“IT WAS ALL ABOUT THE EXCITEMENT OF DISCOVERY, NOT THE MONETARY AWARDS.”

THE GAS TRAGEDY - STRATEGY

From the eyes of a chemical engineer regarding styrene.

Amidst the greatest crisis of 21st centuary, visakhapatnam had to face another catastrophe in the the name of styrene gas. Claiming almost 11 live in the pre-dawn of disaster, it gravely effected the lives of thousands of living in the radius of 3 miles around the factory. Now lets dive into the situation as chemical engineers and look at the tragedy.

Styrene is an organic compound with the chemical formula $C_6H_5CH=CH_2$. This derivative of benzene is a colorless oily liquid, although aged samples can appear yellowish.

The compound evaporates easily and has a sweet smell, although high concentrations have a less pleasant odor. The density of the substance is 909 kg/m³. This is the reason why the most effected people were the ones lying at low altitude.

Storing styrene in containers is not as easy as it sounds. The gas is often stored in large stainless steel containers to avoid the to.

High temperatures increase styrene vaporization and subsequent build up of polymer.Normally, the preferred storage temperature is l0-18°C (50-65°F). If the temperature approaches 20°C (70°F), the tank must be cooled. Under no circumstances should the temperature exceed 25°C (77°F). Polymerization Inhibitors like TBC are circulated throughout the system.

TBC is such an effective polymerization inhibitor that no styrene polymerization will occur until the TBC is almost completely exhausted.In the absence of TBC , styrene will react with another molecule, and a chemical bond is formed between them.

The activity is transferred to the second molecule, which then reacts with another molecule. This process, called polymerization propagation is an exothermic reaction.Also, the rate of polymerization increases with increasing temperature. These two factors create an autocatalytic or "snowballing" situation.After total TBC exhaustion, the reaction would start quite slowly, taking 10 days or more to reach a temperature of 65°C. At this point, about 15% of styrene would be converted to polymer.During the next 10-36 hours, the reaction rate would increase exponentially.

As the remaining 85 % of the monomer polymerizes, the temperature would rise very rapidly to 200-250°C.

If the storage tank is not vented, or the vents have become plugged with polystyrene, pressure may increase to the point that the tank will rupture explosively. This is how things went south in one of tge storage tanks.

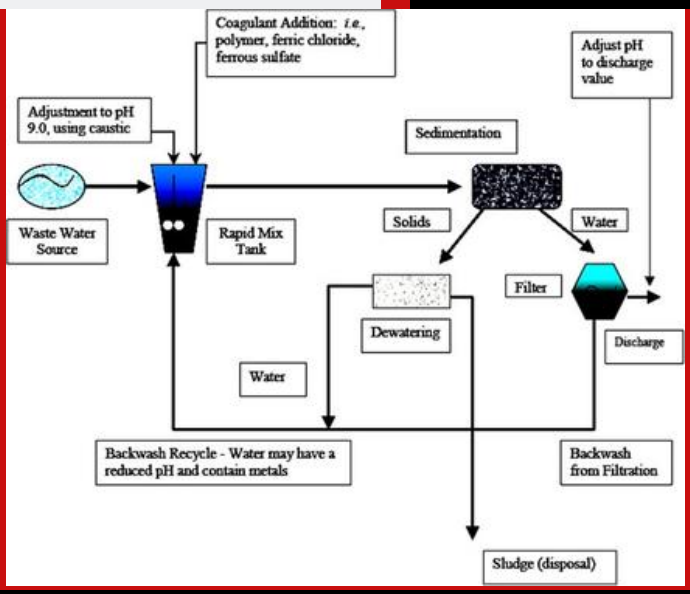
In the end ,on 7th of may 2020 the gas started leaking out of the containers eventually leading to a tragedy!

REMOVAL OF HEAVY IONS

How many of us use materials that are produced from factories? I say many of us, no, not just many of us but everyone in this world use products that are produced by industries so, on an average how many products have to be delivered or packaged per day to reach the needs of a common individual? I say some billions of materials and end products are being used and are handed over to us. Let's skip all the process that happens in order to mould a product and jump directly into the water part. How often do people use water, I didn't mean in terms of drinking guys, but in terms of industrial applications.

When it comes to the usage of water we require it in 'tons' and why do we require water so much? We require water to shape the necessary object, undergo it through many chemical reactions, physical reactions and what not, but , the major part of water is played for the cooling process of machines. We do not want our machines to overwork or damage them do we?

So, we have to cool down the machines in order to make them run for a longer period.Hence, water is poured down on the machines to reduce their temperature and to have smooth operation.



Which industries release heavy water into seas majorly? industries such as paints, textiles,metal extraction and finishing and automotive industries are majorly responsible for releasing toxic or waste water. Toxic metals such as zinc, arsenic, lead, cadmium,mercury, copper form soluble salts with water and are easily absorbed by fish and other sea creatures. Even if the waste water is treated, we must make sure that there is permissible amount of metal present in water. conventional methods like chemical-precipitation, ion exchange, and electrochemical removal were developed to remove heavy metal ions from inorganic effluents. But these methods have shown significant disadvantages like high energy consumption, improper removal of ions production of toxic sludge and high sensitivity to pH

.

Hence a more cheap adsorbent and a more reliable adsorbent is used to take care of the removal process. adsorbent properties :

- A mass transfer operation in which a substance from liquid phase is adsorbed on to the surface of solid adsorbent via physical or chemical interactions.
- Pore size and surface area
- Technical applicability
- Cost effectiveness
- Pre-treatment

Types of adsorbents:

1)Adsorption on natural and modified zeolites

Ex: Clinoptilolite, Magnetically Modified Zeolites, Calcined Phosphates

2)Adsorption on industrial by-products

Ex: Fly-ash, iron slag, bagasse, saw dust.

3)Adsorption on modified agricultural and biological wastes

Ex: Hazelnut shell, rice husk, pecan shells, jackfruit, maize cob.

4) Adsorption on activated carbon.

Experimental setup used:
1) Batch process using a magnetic stirrer
2) Fixed Bed Column
3) Inverse Fluidization
Among these three one of the process is batch process using a magnetic stirrer .This is a simple process in which a synthetic
salt is used solution is prepared with distilled water . Adsorbent is added to it and kept on a magnetic stirrer. Initial concentration of the sample is
measured and samples at known time intervals are taken , filteredand analysed for their concentrations.

The metal ion removal efficiency depends on a number of factors such as initial concentration of metal ions, particle size of adsorbent, speed of stirrer, temperature, pH and time of adsorption. By varying the above factors, adsorption efficiency may be increased.
There might be many processes in which we can complete the removal of ions but opting the most economic way and the way in which we can produce more unionized water matters the most. Such ways are mentioned above.

Chemical Engineers

-Warriors of nature

In this era, humans are so self - centered that they are blinded by the profits which they earned whilst tearing down the Earth. But we as chemical engineers all around the world, together are trying to make this world a better place with innovating ideas to deal with the day by day arsing problems which are destroying the earth.

Chemical engineers with the advanced technology, monitoring devices, modelling techniques, and operating strategies try to

- Reduce the volume and toxicity of pollutants allowed to enter the air, waterways, and soil
- **S**ignificantly reduce the negative environmental impact of industrial facilities, power plants,transportation vehicles; and allow greater reuse of post-consumer post-industrial waste streams

Accomplishments on the part of cars to reduce air pollution :

- Improved engines with more efficient fuel- and air-management systems
- Catalytic devices that destroy pollutants found in exhaust tailpipes
- Advanced petroleum-refining techniques that produce cleaner-burning fuels.
- The catalytic converter is considered one of the most
- important contributions to the field of air-pollution control. It is now a standard feature on vehicles everywhere. It destroys the three main pollutants found in engine exhaust.

- **It maximized the amount of catalyst-coated** surface area to which the engine exhaust may be exposed
- It minimized the amount of expensive precious-metal catalyst required.
- Hydro treatment, which uses hydrogen gas and a catalyst to produce gasoline and diesel fuel with significantly lower levels of sulphur and lead.

These techniques have made it possible to produce reformulated fuels that function as effectively as earlier leaded fuels, while releasing fewer pollutants.

Other accomplishments

- Chemical-engineering principles are used to
- remove harmful pollutants from both raw source water and contaminated wastewater and also being cost effective.
- The various methods are vacuum or pressure filtration, centrifugation, membrane-based separation, distillation, carbon-based and zeolite-based adsorption, and advanced oxidation treatments.
- Chemical engineers have played a key role in building the post-consumer and industrial waste recycling industry.
- The process for recycling aluminium was developed by chemical engineers in the 1960s, and aluminium is now one of the most widely recycled materials.

Before aluminium is reused, all lacquer, paint, and labels are removed in a heated oven. Cans are then chopped into small pieces and added to a molten aluminium bath along with chemicals to remove any impurities. The remaining aluminium is formed into ingots for reuse by fabricators. As the chemical engineers are trying to protect the earth in their possible ways. Let's try to save the earth in the ways we can because we won't even have a society if we destroy the environment.

Environment and COVID-19

In December 2019, Chinese authorities notified the world that a virus was spreading through their communities, within a few the months the virus has left an indelible mark in the life of every individual on the face of earth. The world is now facing humanity's greatest crisis since World War II. This virus is the Severe Acute Respiratory Syndrome-Related Coronavirus 2 that causes the disease covid-19 infamous with the name coronavirus. On 11 of march 2020, WHO declared it as a global pandemic and warned countries to take immediate actions. Before the start of the COVID-19 pandemic, the air around us had been deemed very toxic to breathe in due to the amount of greenhouse gases that had been emitted over the centuries. The Earth faced rising temperatures, which in turn led to the melting of glaciers and rising of sea levels. Environmental degradation was happening fast due to the depletion of resources such as air, water and soil. But after the coronavirus lockdown commenced, there have been slight changes in the environment.

Impact of COVID-19 Lockdown on Environment:

Air Quality:

After the lockdown was put in place in many countries, there was lesser travelling done by people, whether it be by their own cars, or by trains and flights. Even industries were closed down and not allowed to function. This in turn led to the pollution in the air dropping significantly, as there was a marked decline in nitrous oxide emission.

Water Quality:

Since there were no boats, whether they be fishing or pleasure ones, plying on the rivers and waterways, th e water has cleared up. In areas like Venice, the water became so clear that the fish could be seen and there was better water flow. No doubt, because of the lesser human footfall even the oceans are recovering and marine life is thriving.

Effect on Wildlife:

Again where fish is concerned, the lockdown has seen a decline in fishing, which means that the fish biomass will increase after over-fishing almost depleted it. Apart from that, animals have been spotted moving about freely where once they would not dare to go. Even sea turtles have been spotted returning to areas they once avoided to lay their eggs, all due to the lack human interference.

The covid-19 pandemic has not only taught us the numerous vulnerabilities within healthcare system, public health and communities. It has most especially taught us that our health and safety (of nature too) depends on collective action.

INDUSTRIAL ACCIDENTS DURING THE PANDEMIC

The pandemic brought to a standstill almost the entire world however the industries owing to their importance as a contributor to economy were required to run. All essential industries especially those which involved chemical engineers at some level or another had to run under severe restrictions. Some of which included workers running multiple shifts or understaffing the industry to follow guidelines and this has to an all-time high rate of industrial accidents. There have been more than 30 industrial accidents during the lockdown period.

As per the Industriall reports the main area of concern is regarding Process Safety Management and the area requires newer rules and their better implementation to avoid such incidents in the future. Some of the accidents that occurred so far are styrene gas leak at a plant owned by LG Polymers India Pvt Ltd in Andhra Pradesh's Visakhapatnam, in Chhattisgarh at Shakti Paper Mill in Tetla village, where workers were were exposed to a gas leak while cleaning an open recycling chamber, a boiler at Neyveli Lignite Thermal Power Station

STYRENE GAS LEAK IN VIZAG 2020

in Tamil Nadu exploded, boiler explosion at Yashashvi Raasayan Private Limited at Dahej, Gujarat. These accidents highlighted either negligence of the employees or the management and also the importance of process safety management which is a small part of the many roles a chemical engineer could assume at a plant. Also, to be noted is the fact that most incidents occurred after the industries were allowed to run at maximum potential post relief of lockdown in some areas. The series of

accidents expose a pattern of systemic failures; industries halted without proper shutdowns, processes with poor planning, failure to ensure adequate maintenance andinspection during lockdown leads to accidents while industrial processes are being restarted. Widespread use of contract workers lack of safety inspections, inadequate penal action against safety violations and not fixing responsibility on the employer are some important factors contributing to the accidents. All of the above factors are controllable to some extent by chemical engineers. So while the lockdown did bring a halt to

the present it has only sped up the need for potential engineers to upgrade their skill set and acquire knowledge of various sections and take note from these accidents in order to avoid any kind of problems should a situation like this ever occur in the future.

FOAM

- EVER WONDERED WHY IT IS ONLY WHITE IN COLOR?

Why Is Soap Lather Always White?

Regardless of original soap/shampoo is orange, green, pink, yellow or any other color, you have surely observed that the foam or lather that forms when it's mixed with water and rubbed vigorously is always white in colour.

Why Is Soap Lather Always White?

- The ultra-thin layer of soap (that's formed when it's dissolved with water) is pretty much transparent on
- its own, but the foam looks white, because visible light gets scattered in
- multiple directions after passing through several surfaces.
- First off, the dyes used to impart color to soaps and shampoos are highly diluted. In other words, they only use a tiny bit of dye to color a soap. When we rub soap in water to make lather, an incredibly minuscule amount of dye goes into the formation of lather. Thus, there's little (or almost no) color in the foam to begin with.

How scattering of light effects in formation of white foam?

- White light, as you might recall from your high school science classes, is a combination of visible light of different wavelengths.

- The foam that forms after rubbing soap in your hands is a large collection of tiny soap bubbles. Each individual bubble is actually an extremely thin film of the soap solution. Since soap is a surfactant (meaning that it affects the surface tension of the liquid), it lowers the surface tension of water, which then causes the film to stretch.

- This results in an increase in the total surface area of the film , which causes the already deficient color in the film to spread out and become next to impossible to visually detect.

- The foam in its entirety looks white because when light enters the soap solution, it must pass through a number of tiny soap bubbles, i.e., a number of surfaces. These countless surfaces scatter the light in different directions, which makes the foam/lather.

- That trying to find a color in soap foam is an exercise in futility.

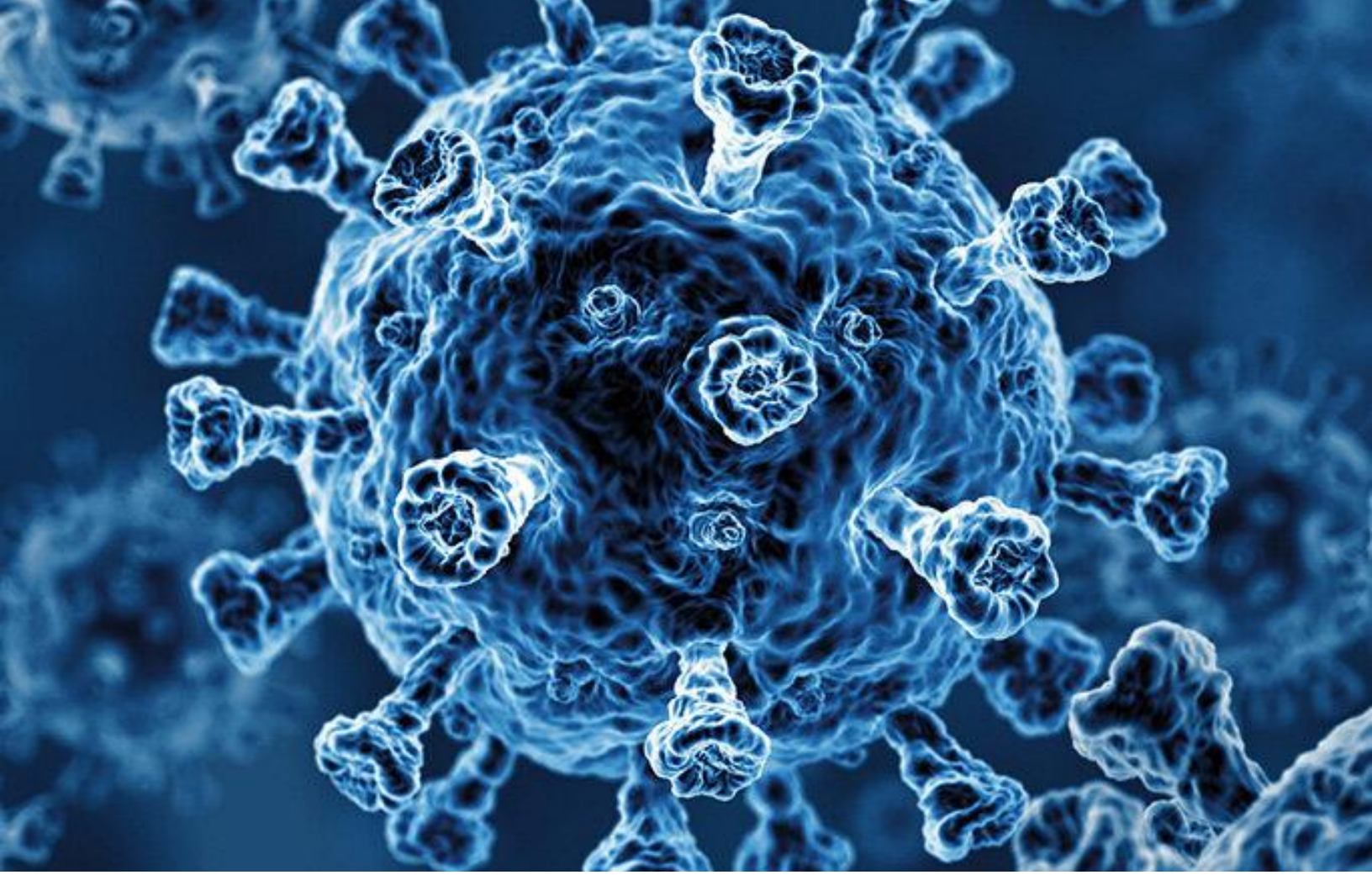
CHEMICAL ENGINEERS IN THE FACE OF PANDEMIC

The scientific community across the world races to provide vaccines, treatments, and protections from the novel coronavirus known as COVID-19. Chemical engineers all over the world have put significant effort in making the world a better place in this pandemic.

“In chemical engineering, we often teach our students about reactions that are occurring in chemical reactors or in engines, but you can use that same sort of methodology to study the reactions that are going on inside a cell,” says Hadley Sikes. As a chemical engineer, Hadley Sikes devotes much of her lab’s effort to devising inexpensive, highly sensitive tests for diseases such as malaria, tuberculosis, and cancer.In recent months, she has turned her attention to developing a diagnostic test for Covid-19. Unlike most diagnostics, which look for the virus’s genetic material (RNA), the test she is working on detects viral proteins, and would yield results quickly, with no specialized instruments required.The tests she develops in her lab, while simple in appearance and use, are based on a detailed understanding of the

complicated mechanisms of reactions such as transfers of electrons between atoms (known as redox reactions), as well as the precise molecular interactions between different proteins.

Apart from social distancing, other important mechanisms to flatten the curve of the epidemiological spread of COVID-19 are keeping our hands clean, using PPE. In this regard, chemical engineering can provide solutions by producing hand-sanitizers, soaps that disintegrate the virus, masks and vaccine delivery systems. Chemical engineers are working to develop a viral, filtration mask that will provide strong protection along with high breath-ability and comfort. Some have been working on designing new nano-engineered membrane materials, some of which can be used for biomedical engineering, including different nano-porous filter materials for protective fabrics, respirators, and rapid separation of biological particles from clinical samples. Infact vapourized hydrozen peroxide process designed by chemical engineers has provided a safe way to reuse N95 masks over 20 times. A hospital in Boston has already purchased this process to clean and use over 80,000 masks per day.



THE PANDEMIC

In the late 1945 US raided on Hiroshima and Nagasaki, it declared a nuclear war that ripped away many families, killed tons of people and made the soil and the air polluted. Today, that is in the 21st century we don't have macro wars but instead micro ones.We don't fight with missiles but with microbes.

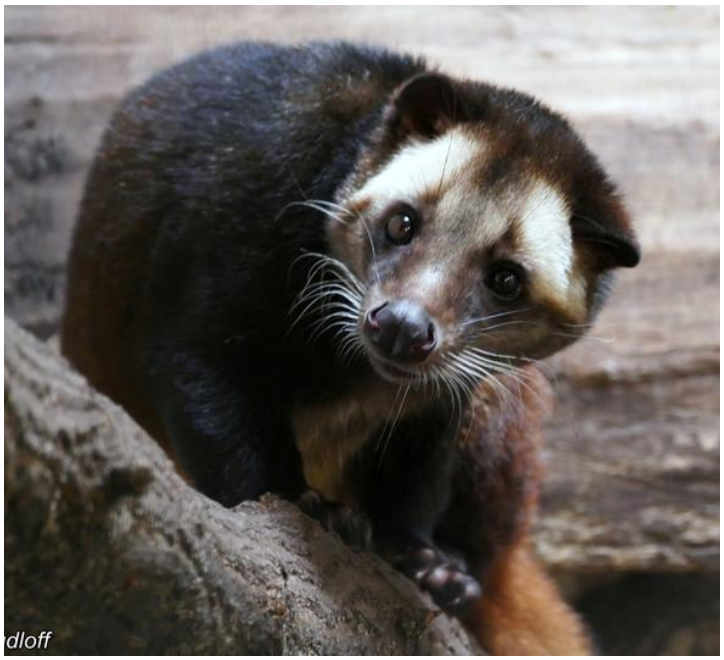
The outbreak of corona virus was initialized in china - hubei to a 55 year old individual on November 17th.

However this remained a secret for a while due to the chinese authorities.

At the end of December 266 cases of COVID-19 were admitted, this was reported to WHO (world health organization) that declared it as a global pandemic.

Chinese eat variety of foods which include snakes,pigs,cows,larvaes , cockroaches,rats and lots of other disgusting stuff.All of this food is sold in wet markets, there might not be a proof about the origin of the virus, but scientists are very sure that both SARS and COVID-19 are from wet markets.

A bat called as Paguma larvata is the reservoir of the virus and a scaly mammal called

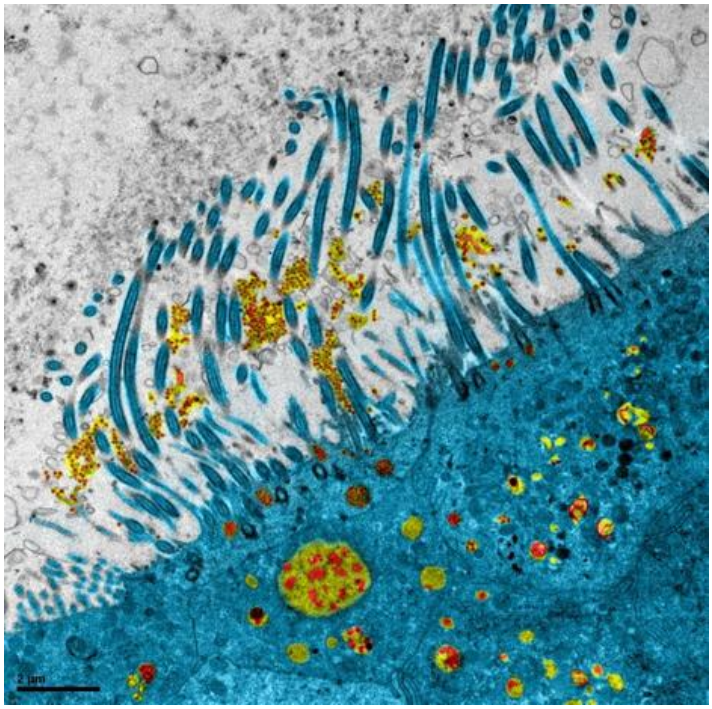


pangolin served as an intermediate host.

The virus has spread through the intermediate host to the animals and the humans picked it from the wuhan wet market.

The virus mostly resides on the surface of things touched by a an affected person, it waits for a host to succumb.

Once a host touches the virus with his/ her hands and touches the individual's T- zone he will be affected by it.
The virus enters through our nasal cavity all the way into our lungs and goes straight on to the walls layered with epithelial cells. The virus has spikes made of protein which has a special receptor called ACE2 and injects its new DNA into the cells.

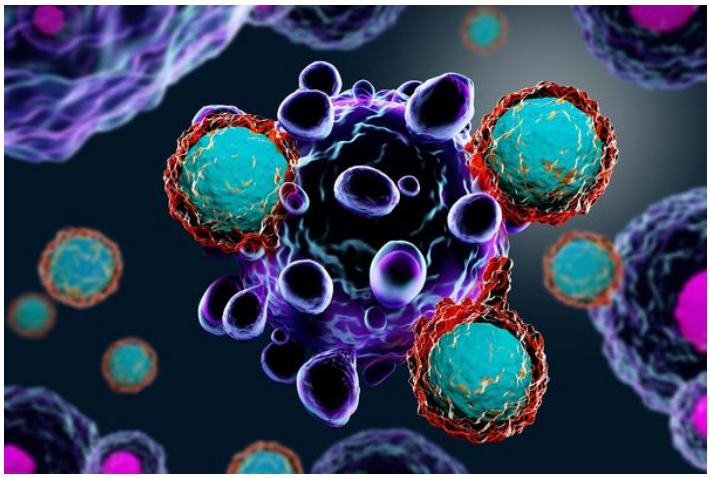


The cells follow the instructions of the new receptor and spread it along the entire wall.Our immune system gets alerted by the new pathogen and tries to stop it - a weak immune system tries to attack but the virus infects few of the immune system cells namely nucleophiles and killer T cells ,the cells which communicate through cytokines go crazy and attack the good cells along with the virus ,the entire lung gets damaged and the host suffers pneumonia and breathing problems which lead to ultimate death.

Epithellilal cells

As we already know the symptoms look very normal and simple

- Dry cough
- Fever
- Nasal issues
- Common cold
- Sore throat



Killer T cells

The virus needs an incubation period of about 10-14 days ,so we might not know that we are even affected with it.

Hence, stay safe and do not touch anything, even if you touch anything make sure that you wash your hands very well so that the virus does not even have a chance to enter us. Use an alcohol based sanitizer that kills the germs instantly, wear a mask and protect yourselves with gloves.

Chem quiz

Toughen your brain muscles

1. _____ is often used to remove gases fr om gas streams that may be harmful downstream or when released from the process.

2. A simple stirring device used to provide turbulence and mixing of the contents of a vessel containing a liquid is _____

3. A plate used in an item of equipment to influence the rate or direction of a flow of material.

4. A general name for processes that use carbon dioxide as the reactant and involve dissolving the gas in an aqueous solution.

5. Two or more controllers working together to control a process. The output of the main (or master controller) is used as the _____control.

6. A catalytic process that was once used to convert hydrochloride gas to chlorine gas used in the manufacture of bleaching powder.

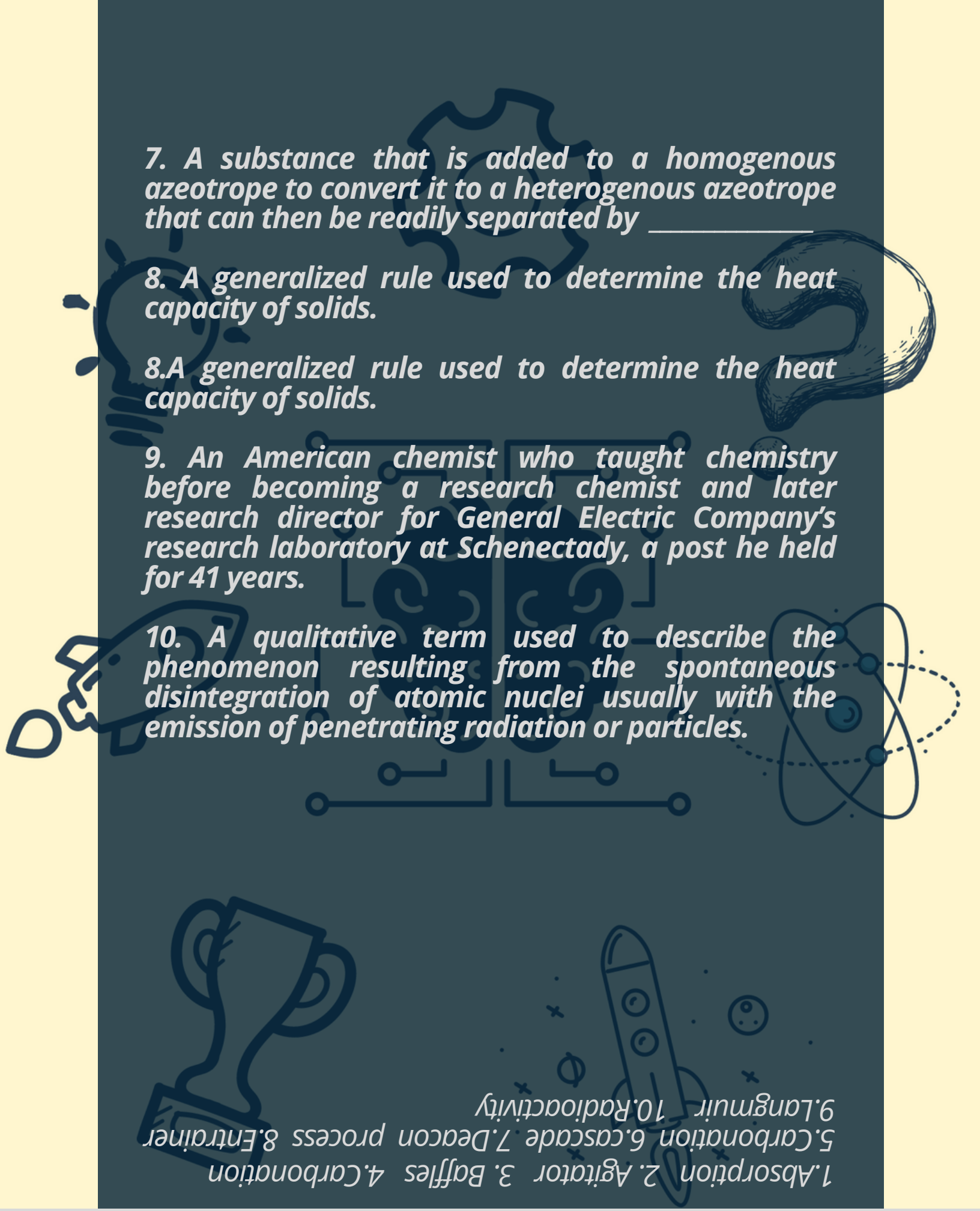
7. A substance that is added to a homogenous azeotrope to convert it to a heterogenous azeotrope that can then be readily separated by _____

8. A generalized rule used to determine the heat capacity of solids.

8.A generalized rule used to determine the heat capacity of solids.

9. An American chemist who taught chemistry before becoming a research chemist and later research director for General Electric Company's research laboratory at Schenectady, a post he held for 41 years.

10. A qualitative term used to describe the phenomenon resulting from the spontaneous disintegration of atomic nuclei usually with the emission of penetrating radiation or particles.



1.Absorption 2. Agitator 3. Baffles 4.Carbonation
5.Carbonation 6.cascade 7.Deacon process 8.Entrainer
9.Langmuir 10.Radioactivity

FACTS TIME

1. Air becomes liquid at -190 degrees centigrade.

2. Ununoctium is the heaviest metal found so far.

3. Fire spreads uphill quicker than downhill. That is because temperature considerably affects the rate of combustion.

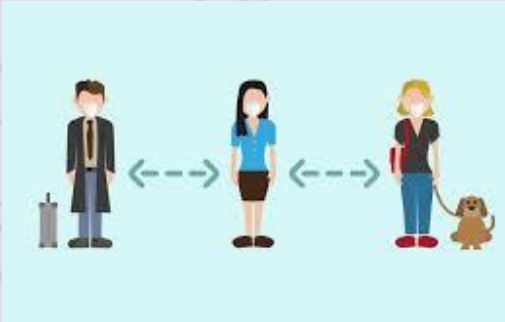
4. The most abundant element in the universe is hydrogen.The most abundant element on the Earth is Oxygen.

5.Hot water freezes quicker than cold water.

6. Thermal conductivity of diamond is 2300 W/m K.

Safety measures for Covid-19

- Regularly and thoroughly clean your hands with an alcohol-based hand rub or wash them with soap and water.



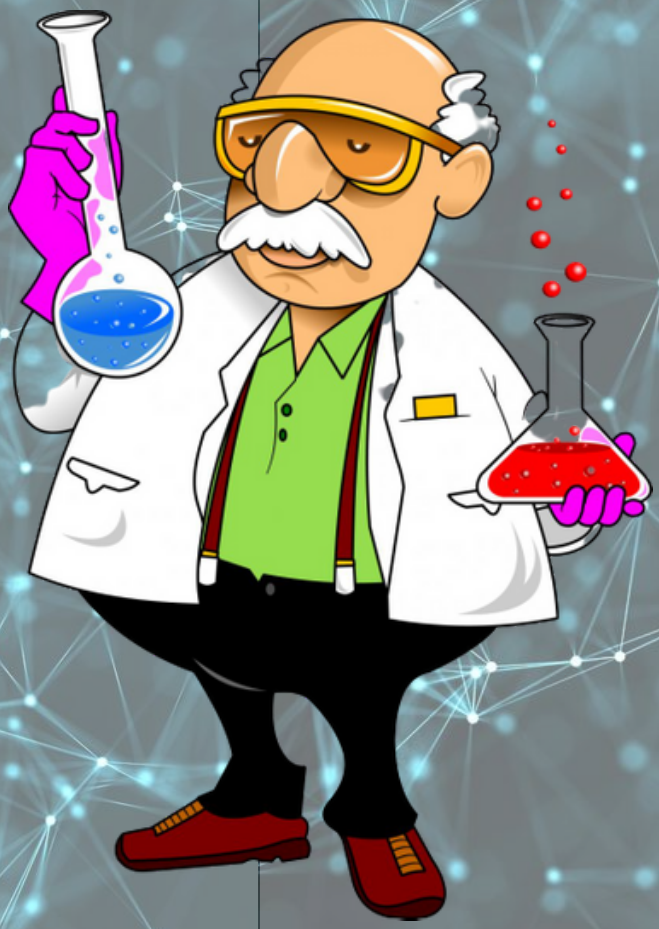
- Maintain at least 1 metre (3 feet) distance between yourself and others.

- Avoid touching eyes, nose and mouth.

- Sneeze using the re-flexed arm position

- Stay home and stay safe

Stay tuned to



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