

CHAPTER 1

CHEMISTRY : THE CENTRAL SCIENCE



ဓာတုဗေဒ



ဗဟိုချက်



သိပ္ပံ

1.1 CHEMISTRY AS CENTRAL SCIENCE

1.2 MILESTONES IN THE HISTORY OF CHEMISTRY

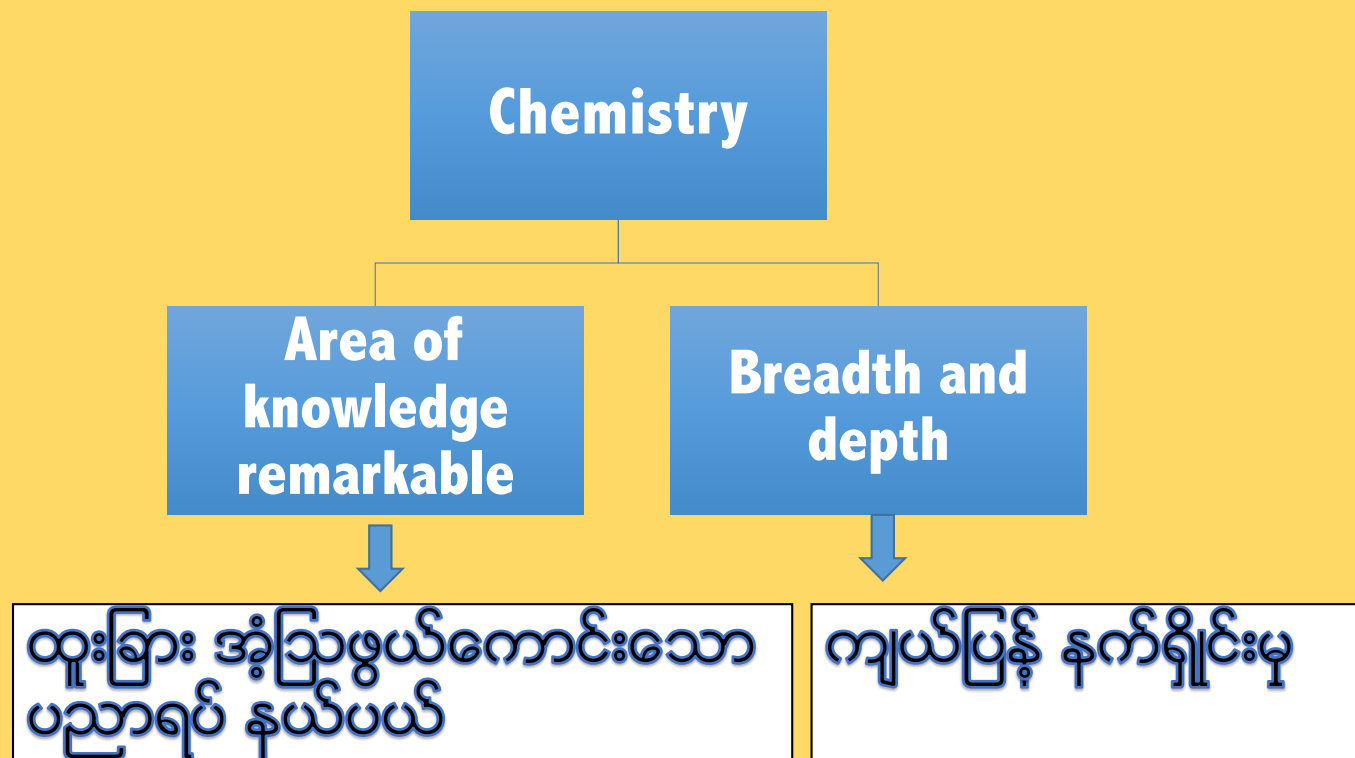
1.3 IMPORTANT OF CHEMISTRY

1.4 BRANCHES OF CHEMISTRY

1.5 UNDERSTANDING CHEMISTRY

**1.6 THE PRINCIPAL GOALS IN BASIC EDUCATION
HIGH SCHOOL CHEMISTRY**

1.1 CHEMISTRY AS CENTRAL SCIENCE



Chemistry is an area of knowledge remarkable for its breadth and depth.



**To improve the
quality of our lives**

**Knowledge of
chemistry**



Faster electronic devices



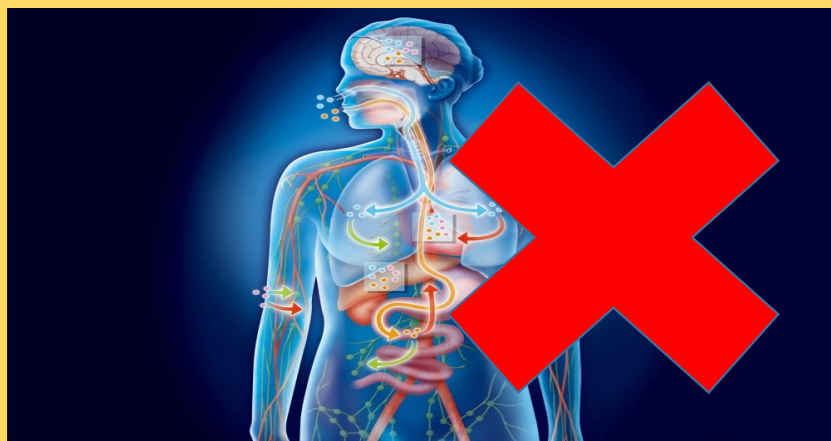
Stronger plastics



More effective medicines and vaccines

All rely on the innovations of chemists





Societal issues

(လူမှု အဖွဲ့အစည်းနှင့်ဆိုင်သော
အကြောင်းကိစ္စများ)

MEDIA



Challenges



Climate change



Water contamination



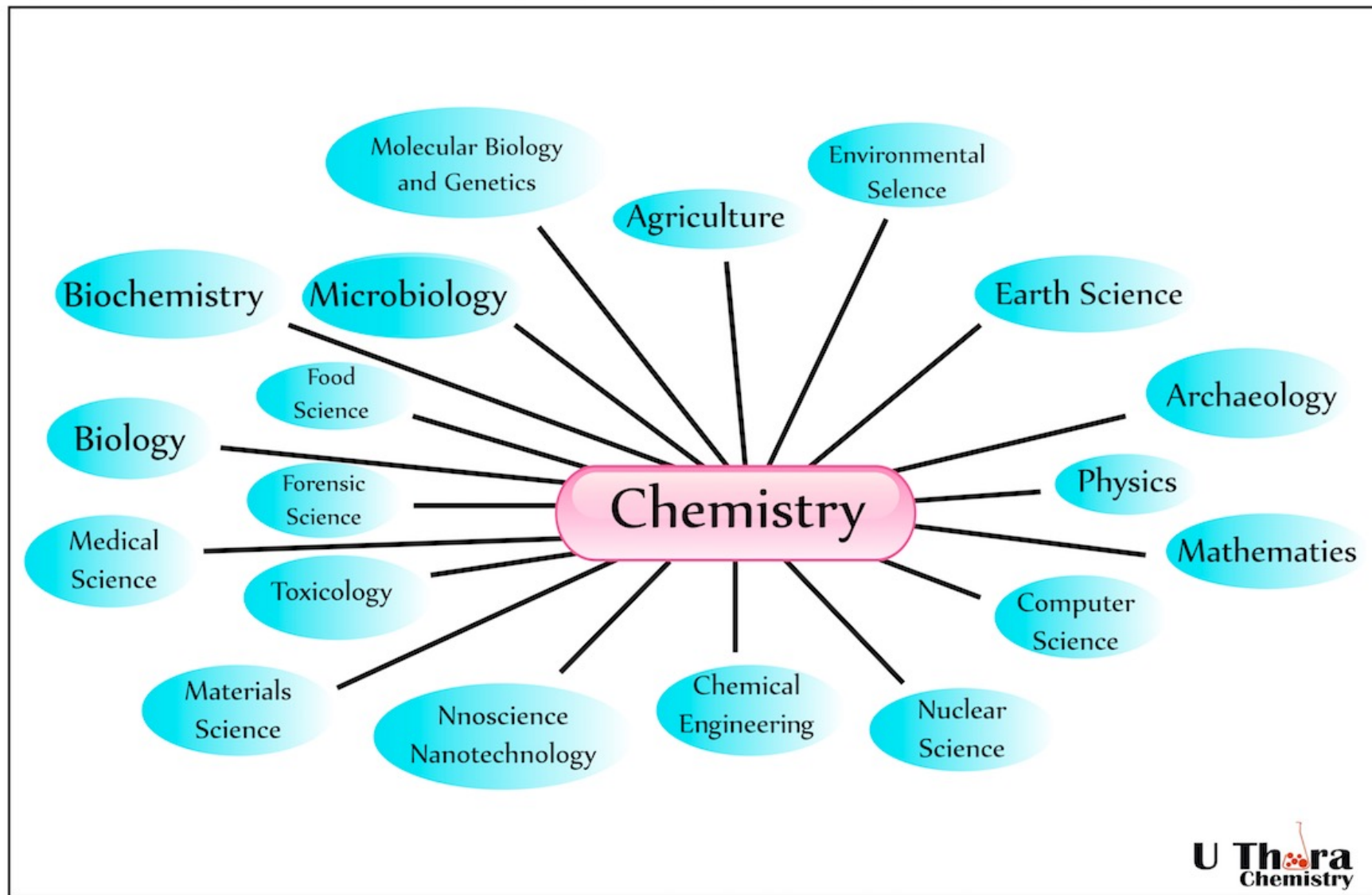
Air pollution

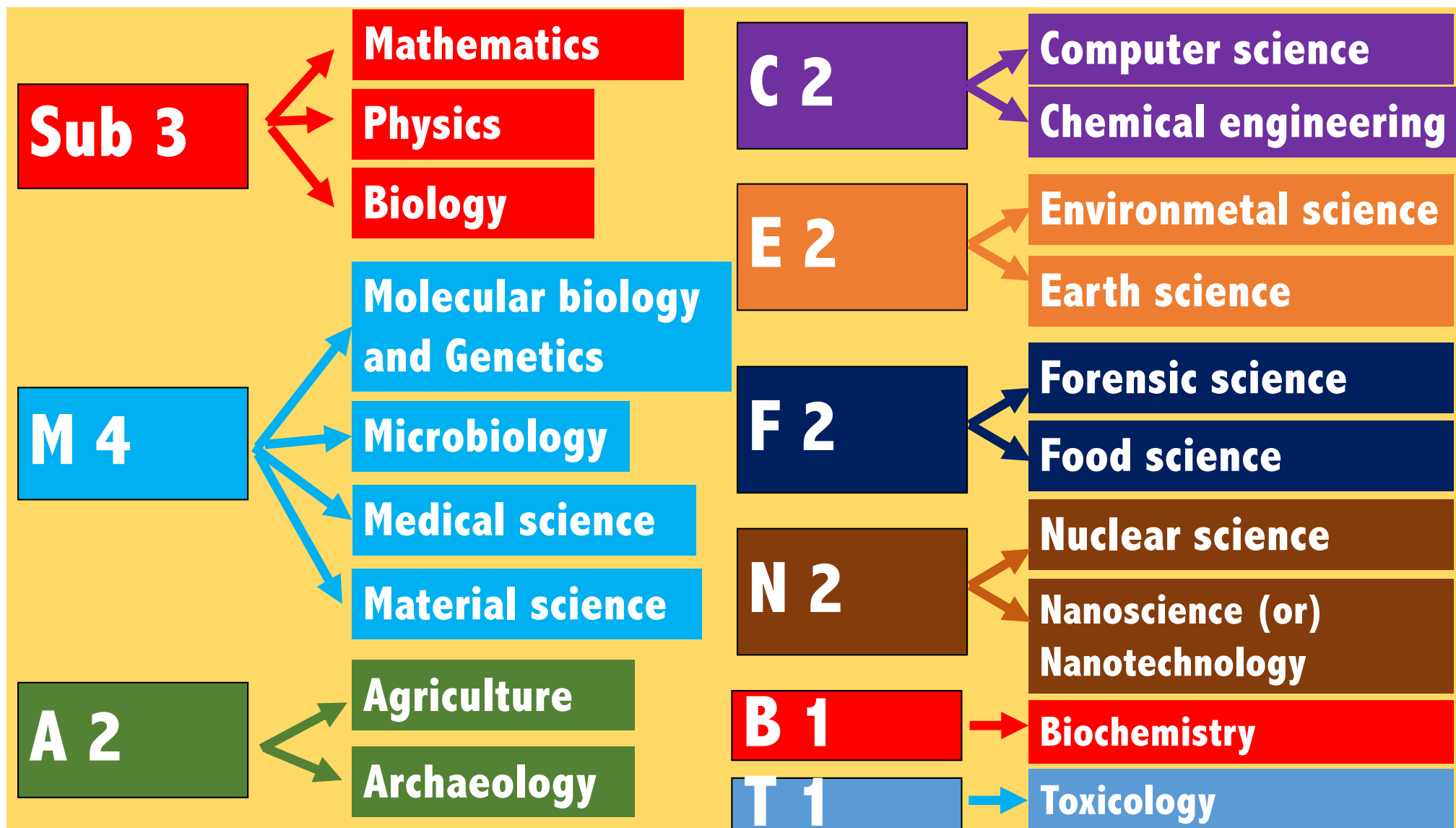


Food shortages

CHEMISTRY

THE CENTRAL SCIENCE





Mathematic



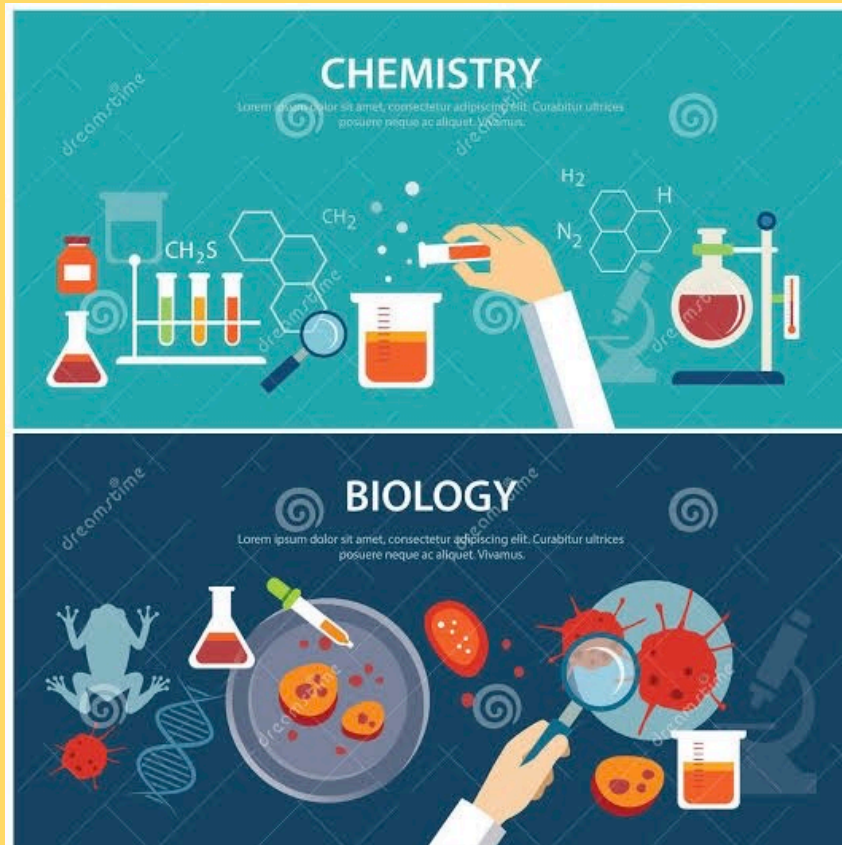
Chemistry

- Titration**
- Rate of reaction**
- Laws**
- Mole concept**
- Solubility**
- etc**

Physics  **Chemistry**

- Energy**
- Atom**
- Fundamental particles**
- etc**

Biology ↔ Chemistry



Molecular biology & genetic



Chemistry

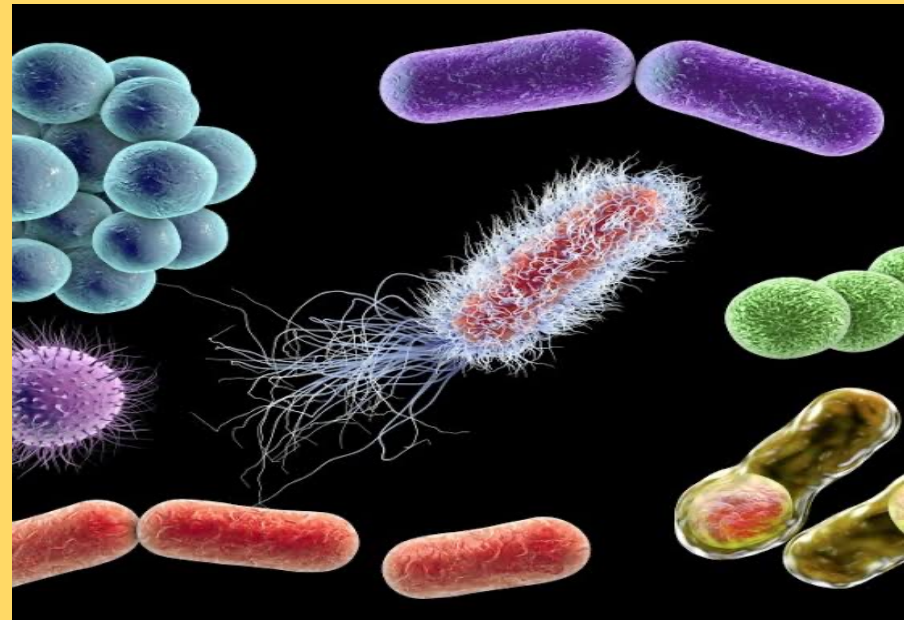
**-DNA
-genes
-etc**



Microbiology

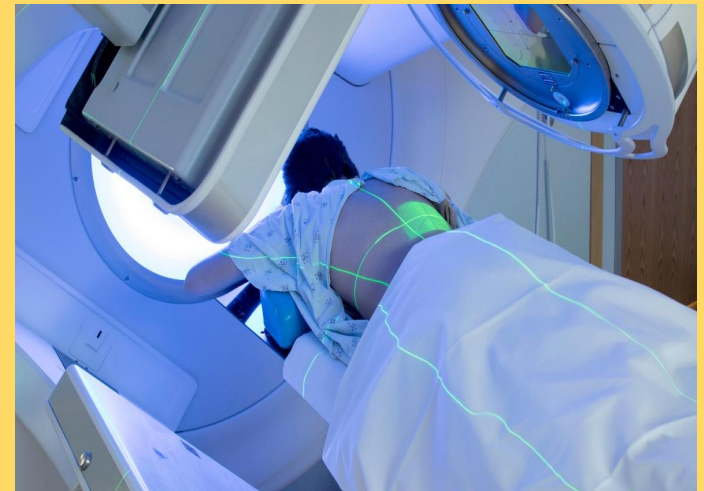


Chemistry



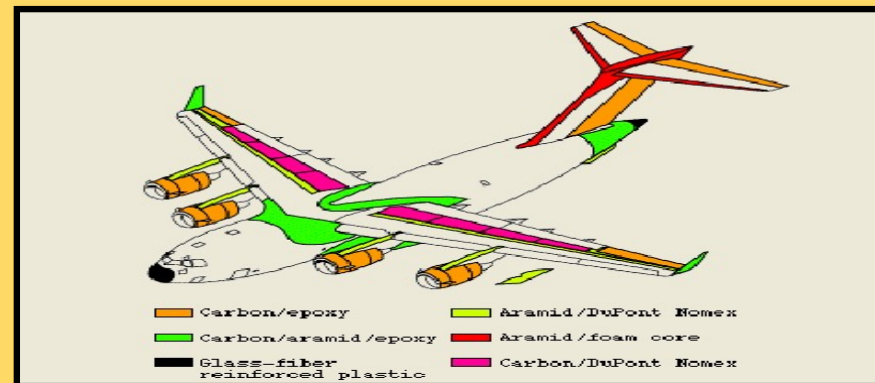
Medical science ↔ Chemistry

- medicine**
- vaccine**
- radiotherapy**
- etc**



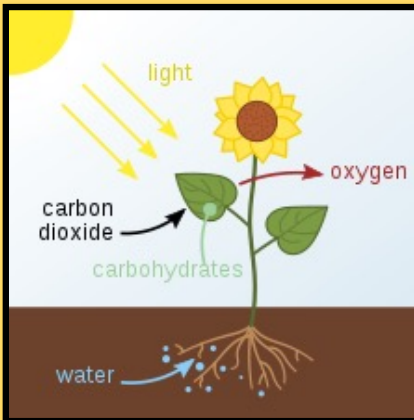
Material science ↔ Chemistry

- Engineering
- Physics
- Chemistry
- Mathematics



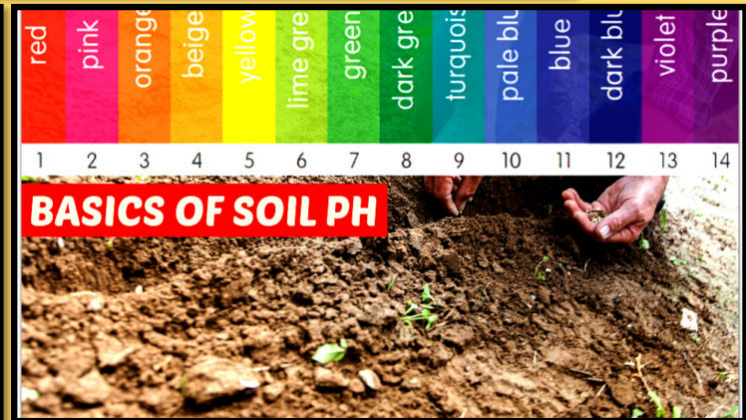
Agriculture ↔ Chemistry

- Fertilisers
- Insecticides
- Pesticides
- Photosynthesis
- Plant hormone
- Soil reaction
- etc



Phytohormones
(Plant hormones)

	Germination	Growth to Maturity	Flowering	Fruit Development	Abscission	Seed Dormancy
Gibberellin	✓	✓	✓	✓	✗	✗
Auxin	✗	✓	✓	✓	✗	✗
Cytokinins	✗	✓	✓	✓	✗	✗
Ethylene	✗	✗	✓	✓	✓	✗
Absciscic Acid	✗	✗	✗	✗	✓	✓



Archaeology



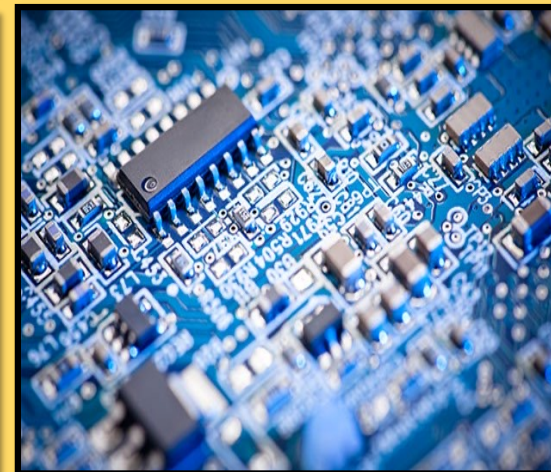
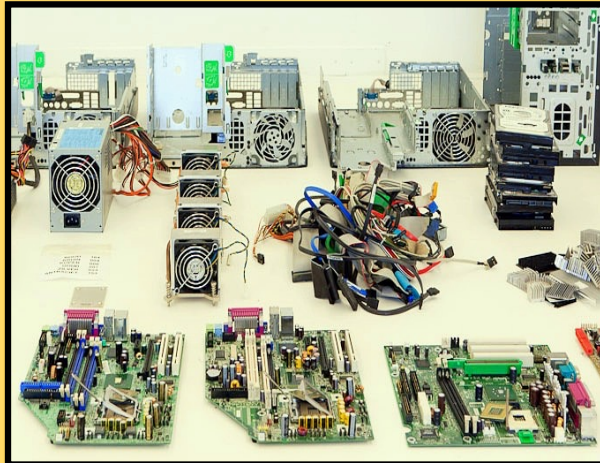
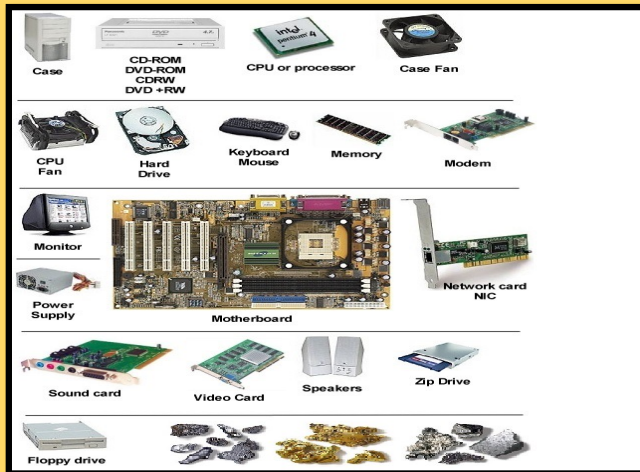
Chemistry

- Antique
- Architecture
- Biofacts
- Material culture
- etc



Computer science **Chemistry**

- metal
- non-metal
- metalloid
- etc



Chemical engineering ↔ Chemistry

- Branches of engineering
- chemical products



Environmental science ↔ Chemistry

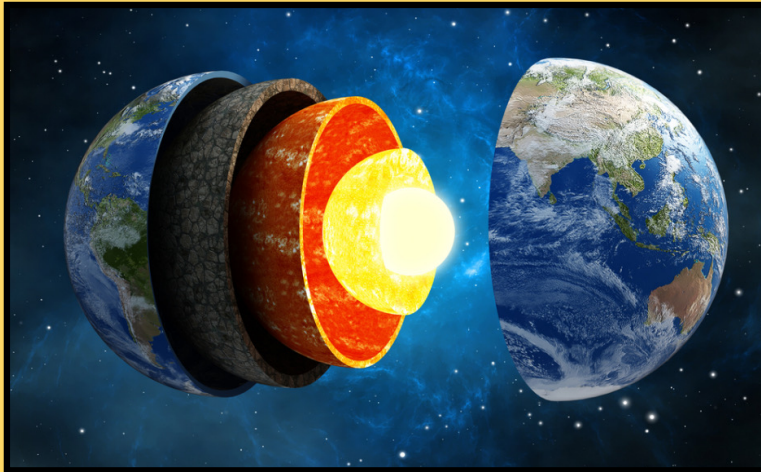
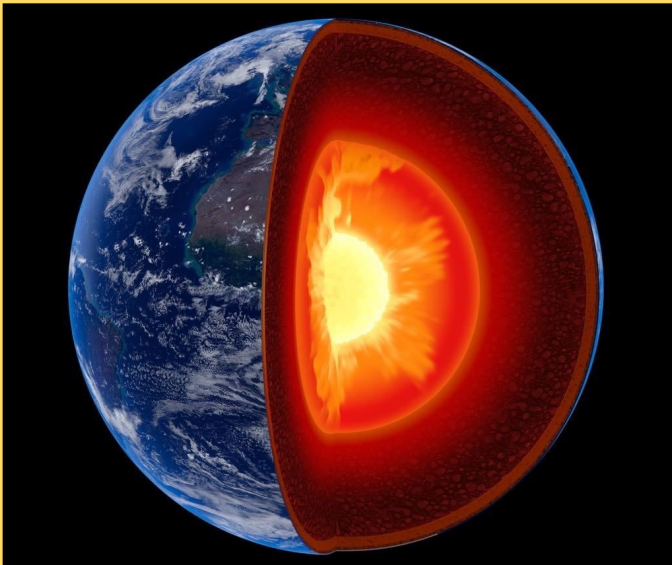
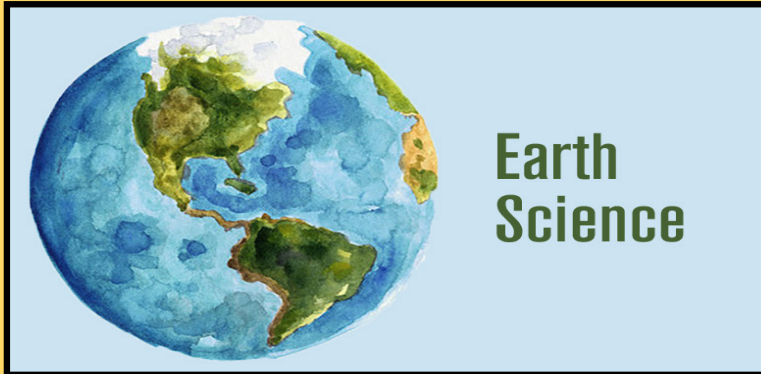
- Atmosphere
- Water
- Soil
- Plant
- etc



Career in Environmental Science

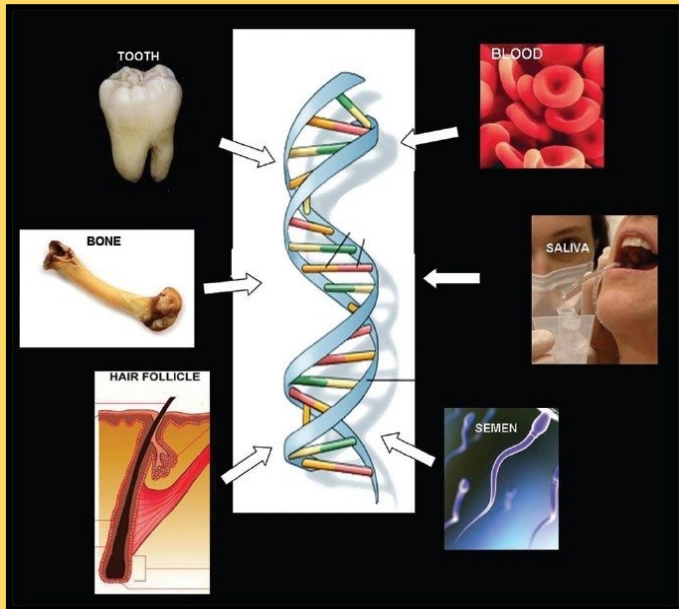
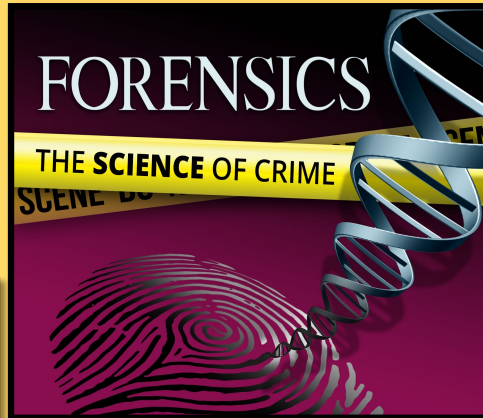
Earth science ↔ Chemistry

-Physical and chemical constitution of the earth and its atmosphere



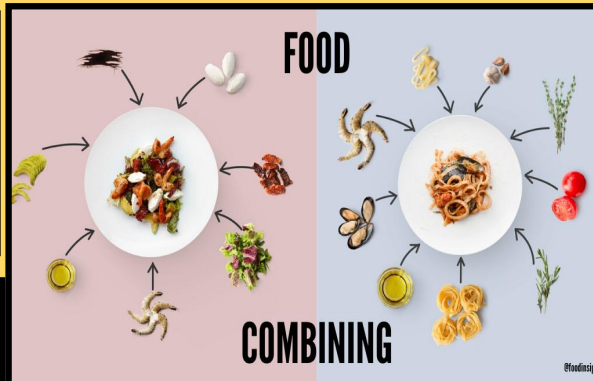
Forensic science ↔ Chemistry

- blood
- DNA
- gunpowder
- finger print
- etc



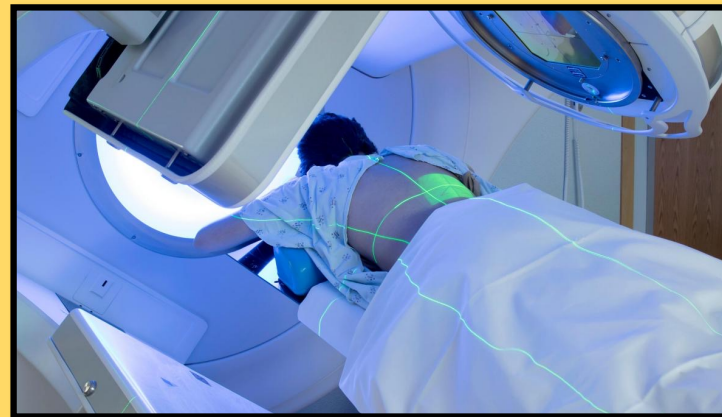
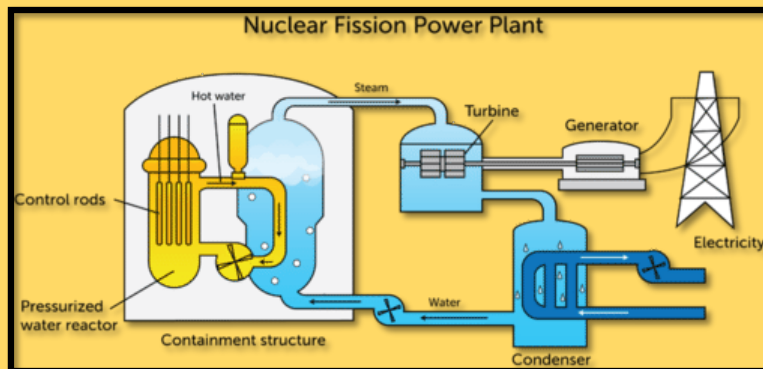
Food science ↔ Chemistry

- combination of food chemical
- new food product
- flavour
- preservative
- dye



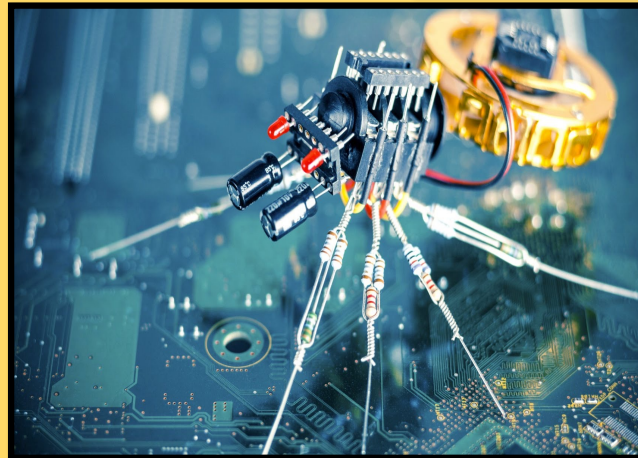
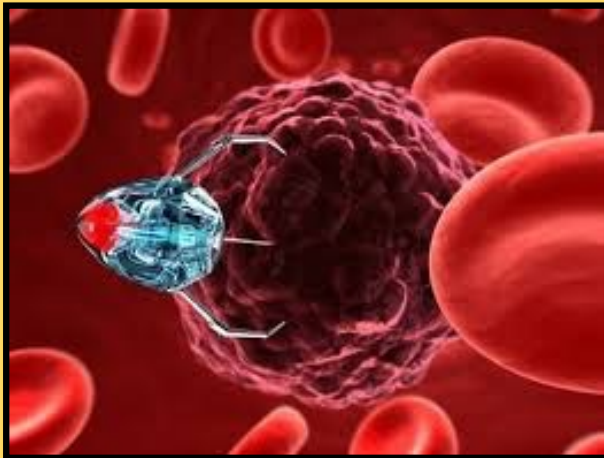
Nuclear science ↔ Chemistry

- Atomic bomb
- Electrical power
- Radiotherapy
- etc



Nanotechnology or Nanoscience ↔ Chemistry

- $\frac{1}{100,000,000}$
- **Ultra small scale**
- **DNA's diameter = 2.5nm**
- **RBC = 7000nm**



Biochemistry ↔ Chemistry

- **Branches of science**
- **Living organisms**
- **Chemical process**

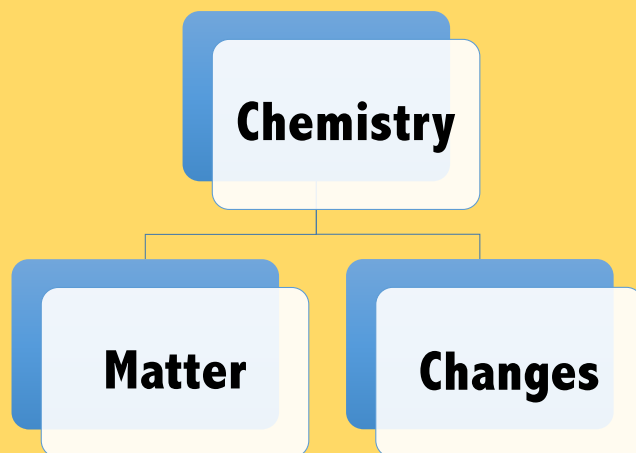


Toxicology ↔ Chemistry

- **Toxic**
- **Pesticides**
- **Insecticides**

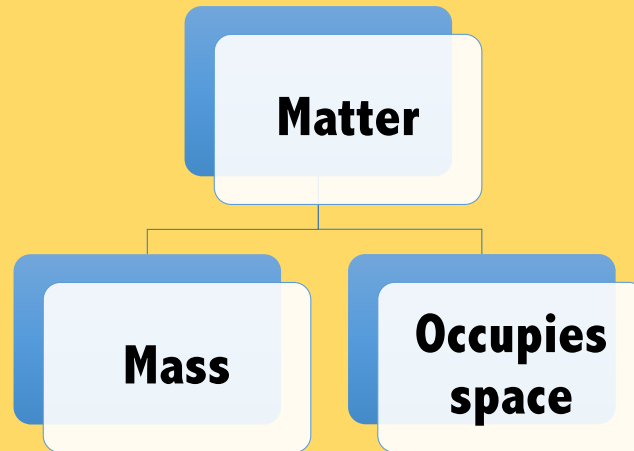


Q. Just what is chemistry anyway?



A. Chemistry is a study of matter and the changes it undergoes.

Q. What is matter?



A. It is anything that has mass and occupies space.

We change matter to make it more useful.



Burning gasoline



To get energy

We practice chemistry everyday.



We cook in the kitchen



We clean our houses



We paint our rooms



We apply cosmetics

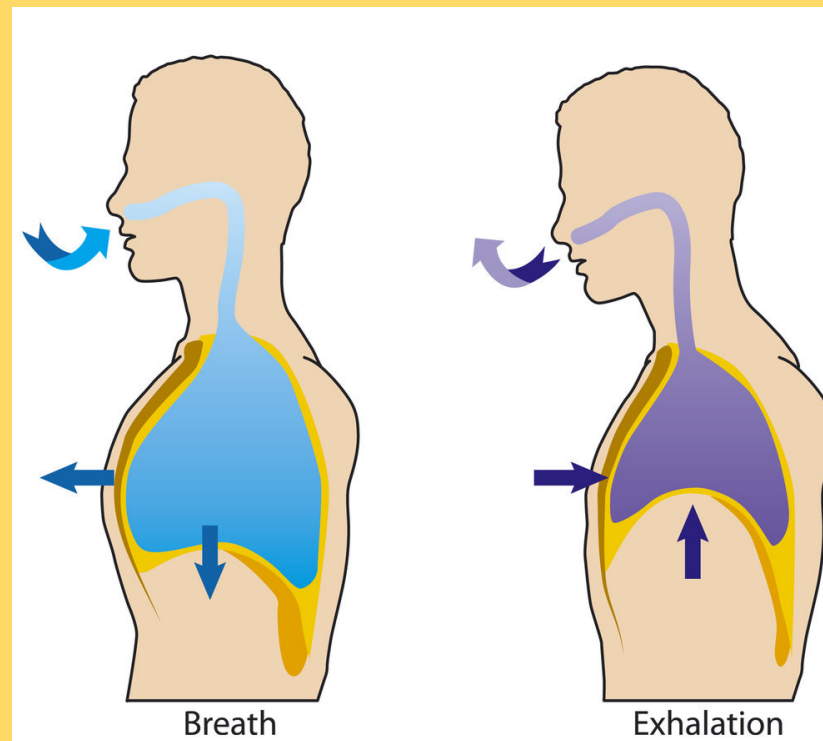


We take medicine



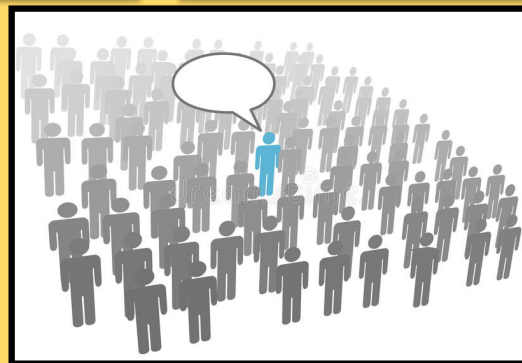
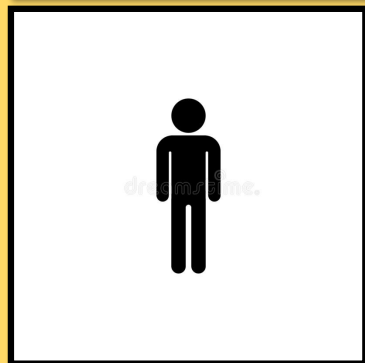
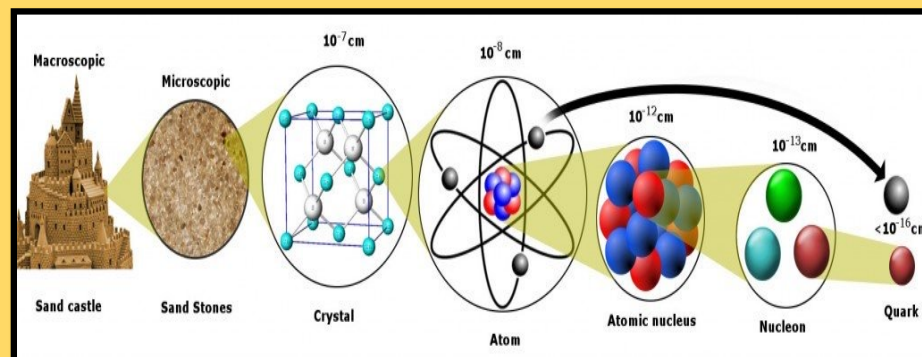
We treat injury

Our body takes oxygen from the air and combines it with part of the food we eat to provide us with energy for everyday activity we undertake.

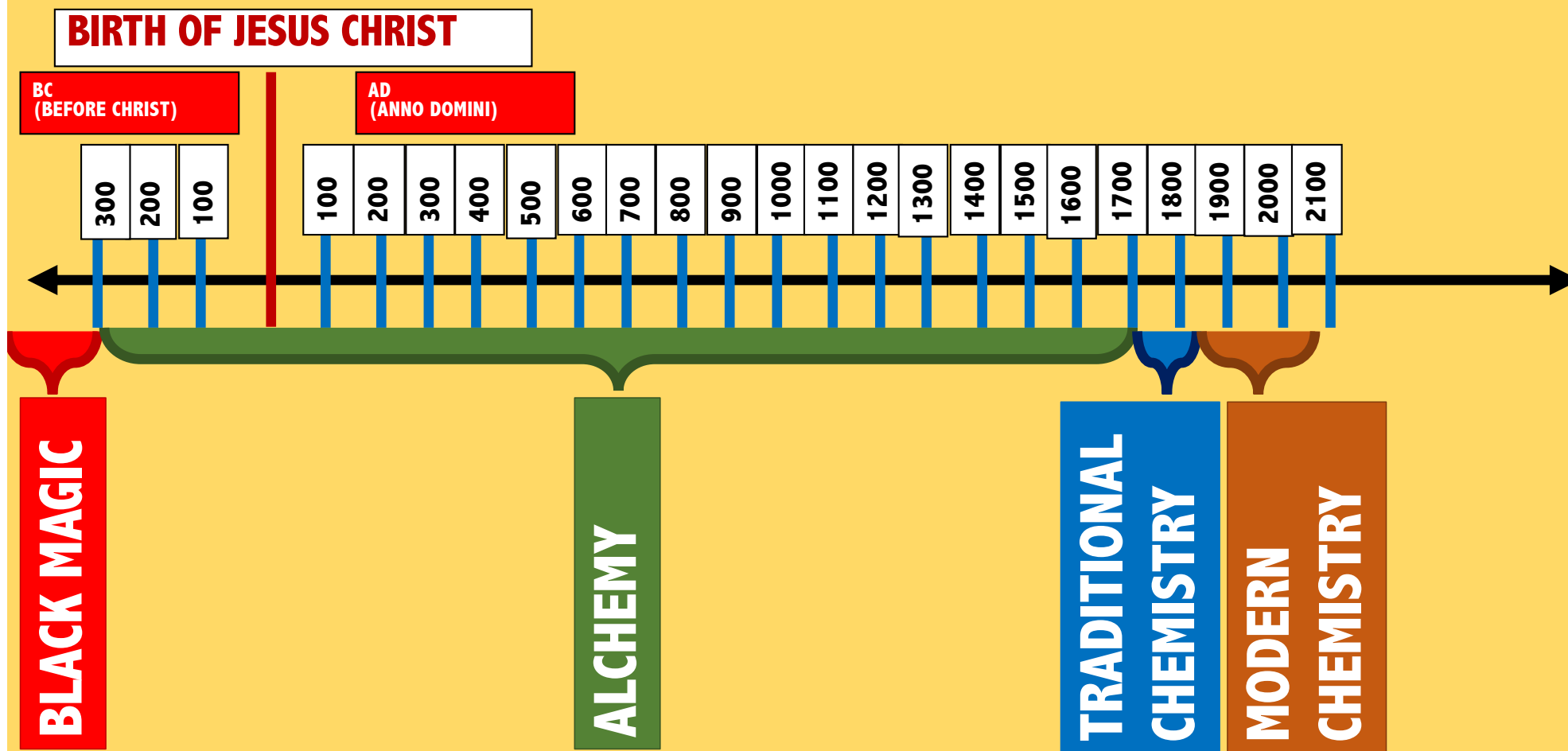


Q. So what is chemistry ?

A. It is a science that touches our life every moment . It deals with matter from tiniest parts of atoms to the complex human body. It goes beyond the individual to affect society as a whole , shaping our civilisation.



1.2 MILESTONES IN THE HISTORY OF CHEMISTRY



There are four categories that classified chemistry on the time line.

(1) Black magic

(Prehistoric time to 300BC)

(2) Alchemy

(300 BC to the end of 17th century)

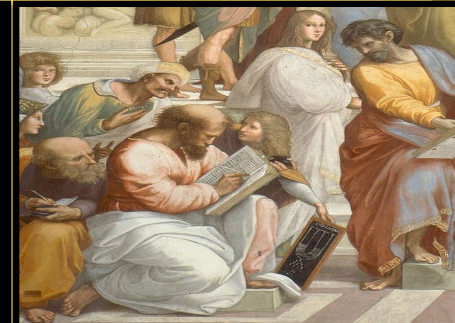
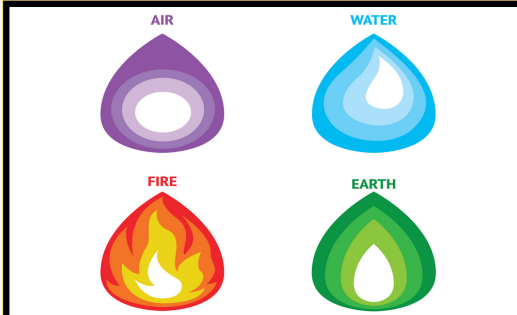
(3) Traditional chemistry

(The end of 17th century up to the middle of 19th century)

(4) Modern Chemistry

(The middle of 19th century to the present time)

(1) Black magic (Prehistoric time to 300BC)



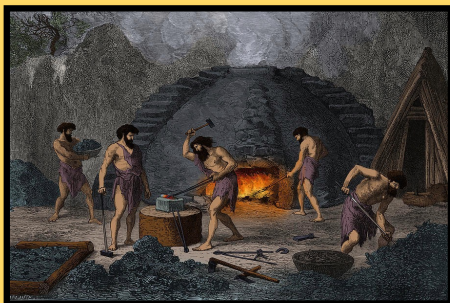
The ancients believed the world made of “**four elements**”.
Earth, Air, Water and Fire

Greek philosophers,
To formulate theories explaining the **behavior of matter**
Without experiments



Aristotle,
-Greek philosopher
-dominated the Greek culture

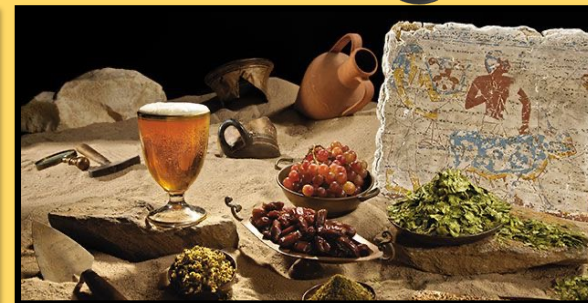
They used fire to bring about chemical changes



Extraction of metals



Making pottery and glazes



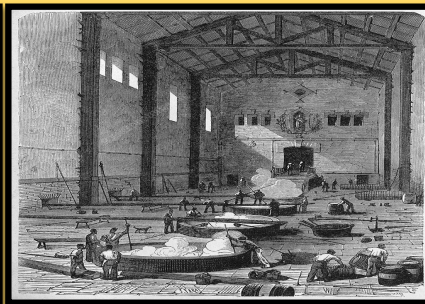
Fermenting beer and wine



**Chemicals from plants
For medicine and perfume**



**Making of
fat into soap**



Manufacture of glass



**Making of alloys
like bronze**

(2) Alchemy (300 BC to the end of 17th century)



From about 300BC to the end of 17th century , the experimental roots of chemistry are planted in **alchemy**, a mystical chemistry that flourished in China and Europe.

Alchemists made several attempts to turn cheaper metals to gold, using the substance called **philosopher's stone**.



Cheaper metals



Gold



By using **philosopher's stone**

They also wanted to find **an elixir that would enable people **to live longer and cure all ailments.****

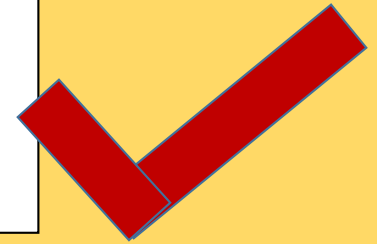


Alchemy Elixir

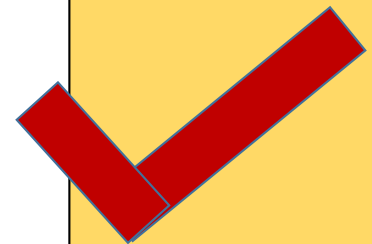
Alchemists never achieved these goals.



Distillation



Extraction

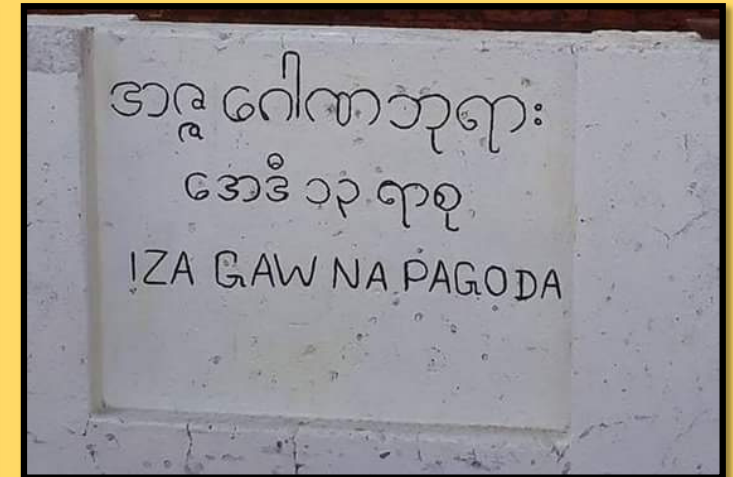


In 1661 , Robert Boyle(1627-1691)



**Basic ideas about the
behavior of gases**

ယခု slides တွင်ပါသော အကြောင်းအရာများသည် textbook နှင့်မဆိုင်ပါ။
ဗဟုသုတ အလိုငှာ.....



ရှင်အဇ္ဈဂေါဏ သည် ပုဂံပြည် နရသူမင်းလက်ထက် တွင် ထွက်ရပ်ပေါက်ခဲ့သော ပုဂ္ဂိုလ်တစ်ဦးဖြစ်သည်။ ရှင်အဇ္ဈဂေါဏဟု လူသိများ ထင်ရှားမှုမရှိသေးခင်က "ရှင်မထီး" ဟု ဘွဲ့အမည်ရှိသည့် ရဟန်းတစ်ပါး ဖြစ်သည်။^[၁]

၁၃ ရာစုတွင် တည်ခဲ့သော ဘုရားဖြစ်သောကြောင့် Alchemy ထွန်းကားသောခေတ် (300 BC to the end of 17th century) နှင့် စစ်ဆေးတွေးဆကြည့်နိုင်ပါသည်။

^ ရာဇဝင်



ဒဏ္ဍာရီရာဇဝင်အရ နရသူ မင်းမဖြစ်မီ နရသူ၏ခမည်းတော် **အလောင်းစည်သူ**မင်းကြီးလက်ထက်ကပင် ဖိုထိုးသောဆရာတော်ဖြစ်သည်။^[၂] အဂ္ဂိရတ်ပညာကို လေ့လာလိုက်စားသည့် ဆရာတော်တစ်ပါးဖြစ်သည်။ ထိုဆရာတော်၏ အဂ္ဂိရတ်ထိုးခြင်းအတွက် ဒါယကာ၊ ဒါယကာမတို့သည် အထောက်အပံ့ပြုကြ၏။ ထို့အပြင် ပုဂံမင်းဖြစ်သူ နရသူသည်လည်း မိမိခံစားစံစားရမည့် အကျိုးကို မျှော်ကိုးကာ ဆရာတော်အား ရက်ရှည်လများ ထောက်ပံ့လေသည်။ ကျောင်းဒါယကာ သူကြွယ် **မောင်ကျော်စွာ** နှင့် ဇနီးမယ်သော်တာတို့မှာ ရှင်မထီးဆရာတော်အား အမြဲတမ်းလှူဒါန်းထောက်ပံ့နေသူများဖြစ်ကြသည်။^[၂] သို့သော်လည်း ဆရာတော်၏ ပြဒါးလုံးသည် မအောင်မြင်ဘဲ ပျက်လျက်ရှိရာတွင် ဒါယကာ၊ ဒါယကာမတို့၏ ဥစ္စာစည်းစိမ်တို့သည်လည်း ဆုတ်ယုတ်လာခဲ့သည်။

ထိုသို့ ပျက်ဖန်များလာသော် ဘုရင်နရသူသည် လျှင်သောအမျက်ရှိသဖြင့် မင်းချင်းတို့အား ဆရာတော်၏ မျက်လုံးကို ဖောက်ထုတ်ခိုင်းလေသည်။

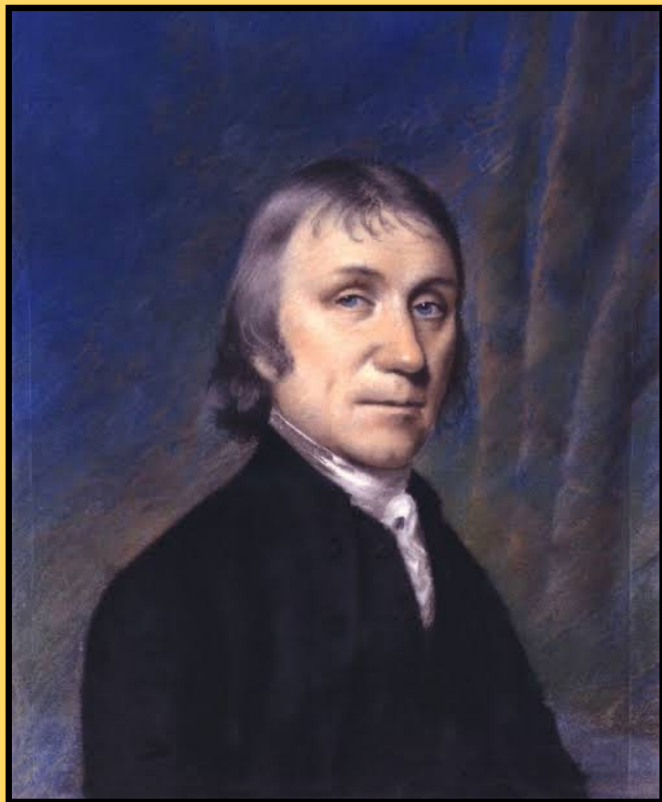
ဆရာတော်သည် မိမိ၏ ပြဒါးလုံးကို စိတ်နာပြီး ကျောင်းတွင်နေသည့် သူတော်တစ်ဦးအား ကုဋိအိမ်ထဲသို့ သွားရောက်စွန့်ပစ်ခိုင်း၏။ သူတော်သည် စွန့်ပစ်လိုက်သည့်အခါတွင် ပြဒါးလုံးသည် သိဒ္ဓိမြောက်ပြီး တဝင်းဝင်းတောက်ပကာလာလေသည်။ (အမှန်စင်စစ် ပြဒါးလုံးသည် '**ချေးရည်နှင့်စိမ်ရမည်**' ဆိုသောအညွှန်းကို '**ချဉ်ရည်နှင့်စိမ်ရမည်**' ဟု အမှတ်မှားပြီး လွဲချော်စွာလုပ်ကိုင်နေမိသဖြင့် မအောင်မြင်နိုင်ဘဲ ဖြစ်နေခြင်းဖြစ်သည်။) သူတော်က ဆရာတော်ရှင်မထီးအား ပြဒါးလုံး ဝင်းဝင်းတောက်သွားကြောင်း လျှောက်ထားရာ ဆရာတော်မှာ ပြဒါးလုံး သိဒ္ဓိပေါက်ပြီဟု သိရှိ၍ လွန်စွာဝမ်းမြောက်လေသည်။^[၂]

ထို့နောက် ဆရာတော်သည် ပြဒါးလုံးကို အမွှေးနံ့သာတို့ဖြင့် ဆေးကြောလေသည်။ ထို့နောက်တွင် ဆရာတော်သည် သူတော်အား ဈေးသို့သွားကာ ရရာမျက်လုံးတစ်စုံကို ဝယ်ခိုင်းလေသည်။ သို့သော်လည်း အချိန်မှာ လင့်နေပြီဖြစ်၍ ဆိတ်မျက်လုံးတစ်လုံးနှင့် နွားမျက်လုံးတစ်လုံးသာ ရလေသည်။ ဆရာတော်သည် ထိုမျက်လုံးနှစ်လုံးကို အတွင်းသို့ ထည့်၍ ပြဒါးလုံးနှင့် ပွတ်လိုက်ရာ မျက်စိအလင်းပြန်ရခဲ့လေသည်။ ထိုအခါမှ စတင်၍ ရှင်မထီးဆရာတော်သည် "ရှင်အဇ္ဈဂေါဏ" ဟု အမည်တွင်ခဲ့သည်။^[၁] (အဇ္ဈ=ဆိတ်၊ ဂေါဏ=နွား) ^[၂]

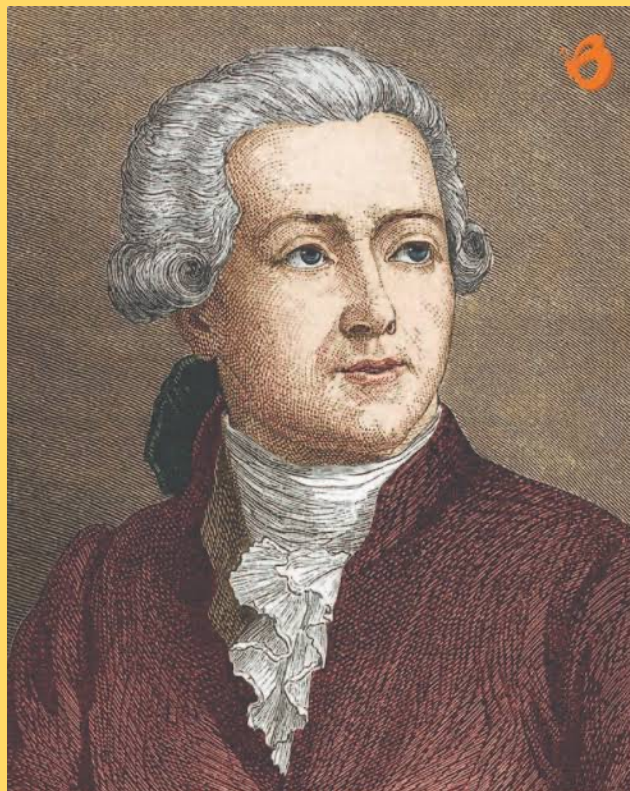
ပုဂံပြည်တွင် ရွှေမိုး၊ ငွေမိုး ရှာသည်ဟူ၍ပင် ယခုအချိန်အထိ ပြောစမတ်ပြုရသည့်အကြောင်းရှိသည်။ ရှင်အဇ္ဈဂေါဏသည် ကြေးရည်၊ ခဲရည်တို့ကို ကျို၍ သူ၏တောင်ရေများ၌ ပြဒါးလုံးကိုတပ်ကာ ၎င်းကြေးရည်၊ ခဲရည်များကို မွေလိုက်သောအခါ ထိုကြေးရည်၊ ခဲရည်တို့သည် ရွှေတုံး၊ ရွှေခဲများ ဖြစ်ကြကုန်သည်။ ဆရာတော်သည် ထွက်ရပ်ပေါက်လုပ်ငန်းကို ဆက်လက်ကြိုးစားရန် တောမထွက်ခင် ပုဂံပြည်တွင်ရှိသော သူ၏ ဒါယကာ၊ ဒါယိကာမအရင်းများအား မ၊စထားစေလိုသောကြောင့်ပင် ဖြစ်သည်။ နောက်ဆုံးတွင် ပုဂံပြည်ရှိ ဒကာ၊ ဒကာမတို့အား သူကြွယ်ဖြစ်အောင် မ၊စခဲ့သည်။ ပုဂံပြည်၌ ရွှေမိုး၊ ငွေမိုး အုန်းအုန်းမြည်အောင်ရွာစေခဲ့သည်။ ^[၂]

Source → wiki

(3) Traditional chemistry (The end of 17th century up to the middle of 19th century)



Joseph Priestley (1774)
-discovered a gas
-later named oxygen



Antoine Lavoisier (1743-1794)
-1768
-French Chemist
-law of conservation of matter
-based on the experimentation method

**Experimentation method
(or)
Scientific method** ✓

**Logical and theoretical
method of the
ancients** ✗



John Dalton (1803)

- postulated Atomic Theory
- All matter is composed of atoms, which are small and indivisible



Amadeo Avogadro (1776-1856)

- By calculating the number of particles in a given amount of a gas
- We use today as Avogadro's constant

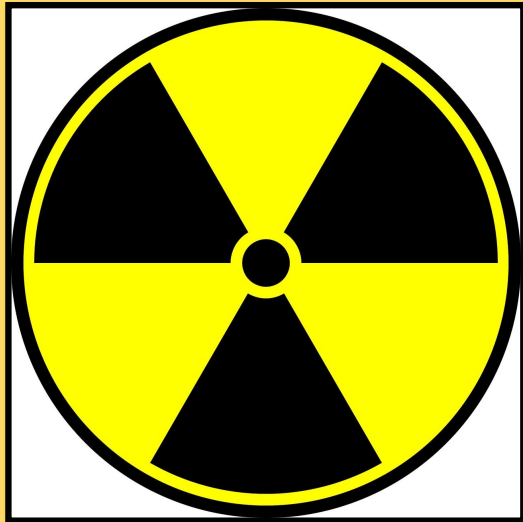
(4) Modern Chemistry (The middle of 19th century to the present time)

Few of areas (In modern chemistry)

- **Synthesis**
- **Separation techniques**
- **Identification and assay**
- **Materials**
- **Polymers**
- **Nanochemistry**
- **Biochemistry**
- **Molecular biology**
- **Green chemistry**
- **Combinatorial chemistry**

20th century

- Technology has grown out**
- Discovered Radioactivity and Artificial intelligence.**



1.3 IMPORTANCE OF CHEMISTRY

- Chemistry is important because everything you do is chemistry.

Chemical reactions occur.....



When you breathe,



eat

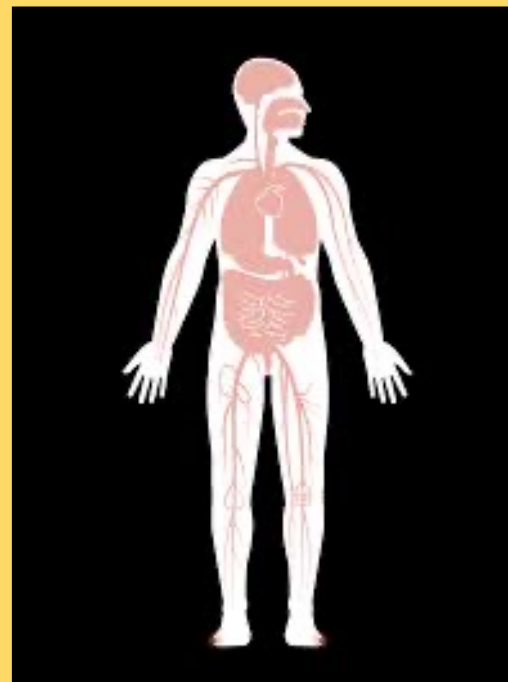


Just sit there reading

You are surrounded by materials and substances, all chemicals.



Even your body is made of chemicals.



The air you are breathing



Oxygen and nitrogen

The book you are reading



**Wood pulp or cellulose
(bleached and treated with various chemicals)**

The clothes you are wearing



Polymers such as nylon or terylene

The seat you are sitting



Plastic polymer, with polyurethane; foam seat padding and metal support.

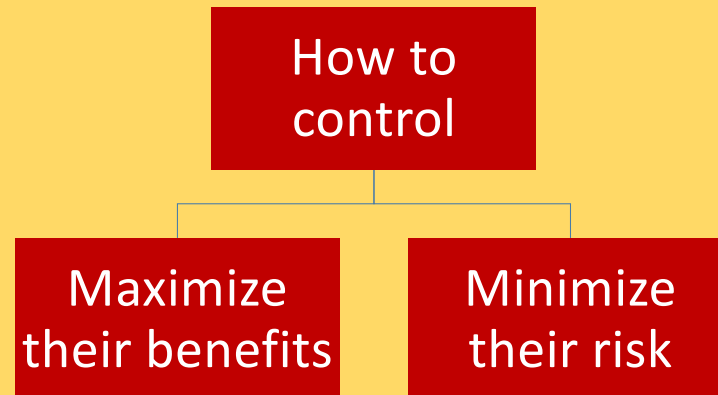
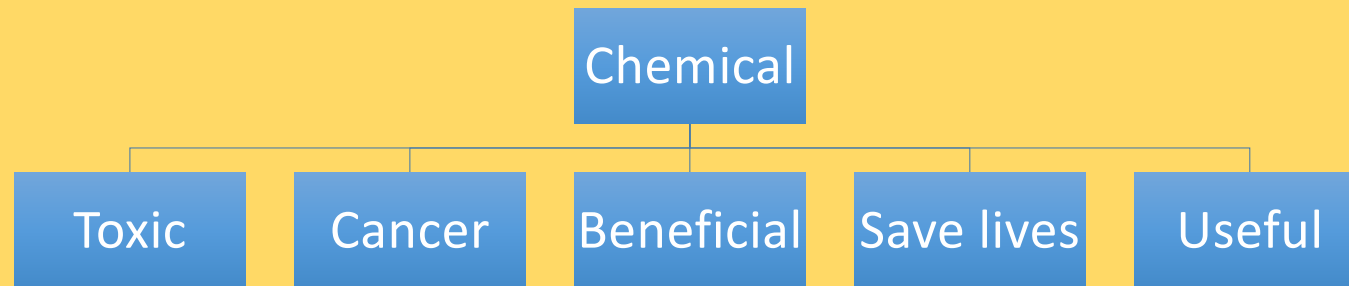
The room you are living



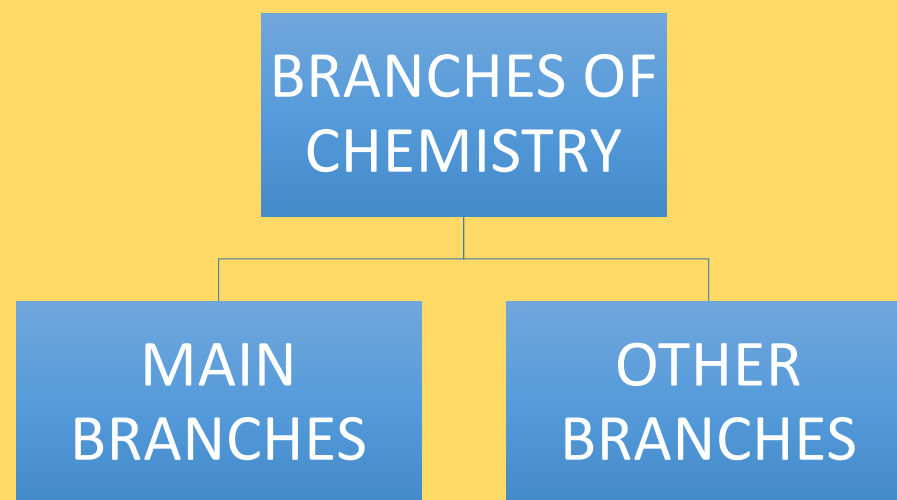
Cement, plastic, concrete and glass

Chemicals provide us with luxuries and improve our leisure time.

All matter is made of chemicals.



1.4 BRANCHES OF CHEMISTRY

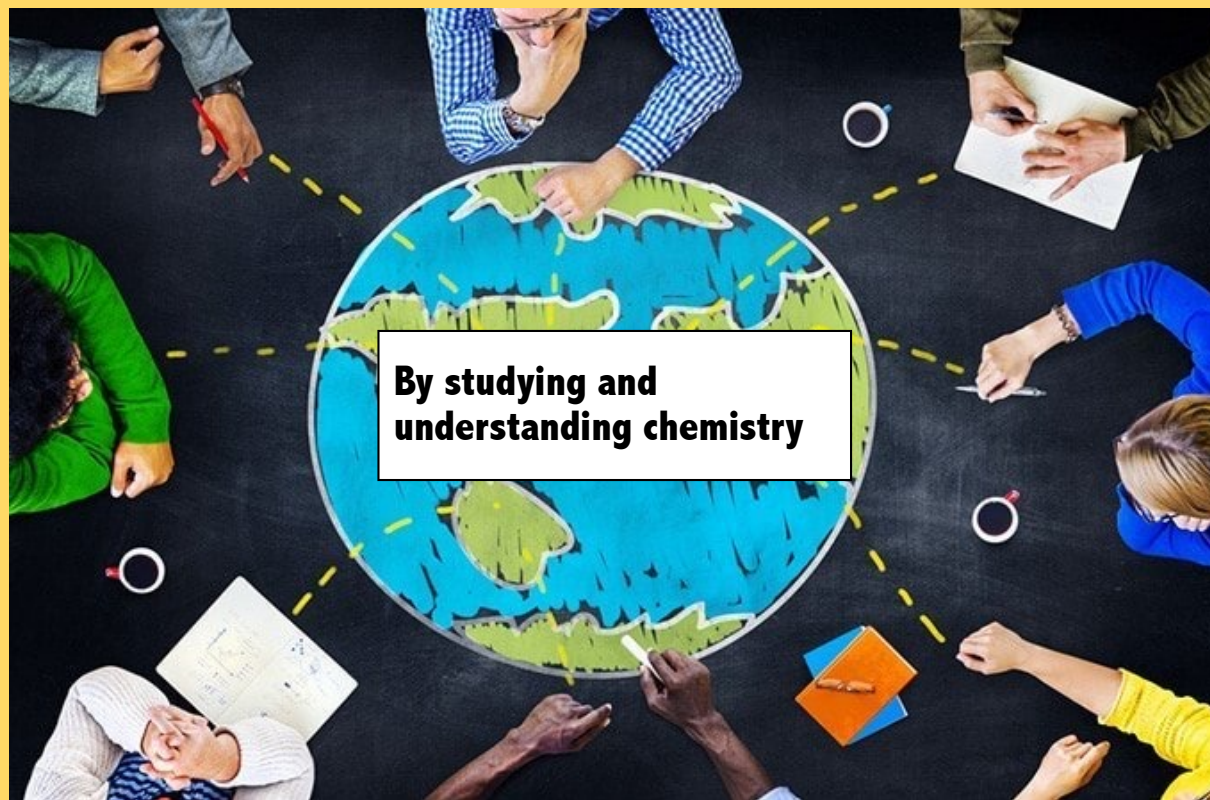


- **Organic chemistry**
- **Inorganic chemistry**
- **Physical chemistry**
- **Analytical chemistry**
- **Biochemistry**

Main branches of chemistry

Branch	Areas of emphasis	Examples
organic chemistry	most carbon-containing chemicals which are hydrocarbons and their derivatives	pharmaceutical, plastics
inorganic chemistry	in general, matter that does not deal with hydrocarbons	minerals, metals and non-metals, semi-conductors
physical chemistry	the behaviour and changes of matter and the related energy changes	reaction rates, reaction mechanisms
analytical chemistry	components and compositions of substances	food nutrients, quality control (QC) and quality assurance (QA)
biochemistry	matter and processes of living organisms	metabolism, fermentation

1.5 UNDERSTANDING CHEMISTRY



By studying and understanding chemistry

A global citizen in the 21st century

More intellectually

Mature

Greater understanding and satisfaction in an increasingly complex civilization

To justify why we have to study chemistry, there are several reasons;



Chemistry is clearly very board.



Every educated citizen



Some knowledge of its scientific basis

To understand the nature of every form of matter

For example



Metals



Drugs



Gasoline



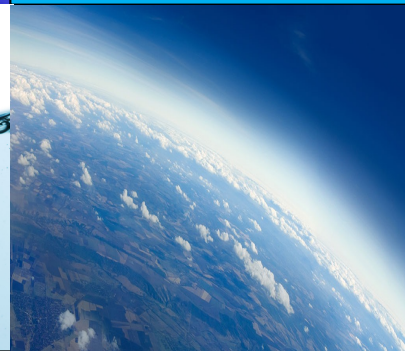
Foods



Earth's crust



Water



Atmosphere

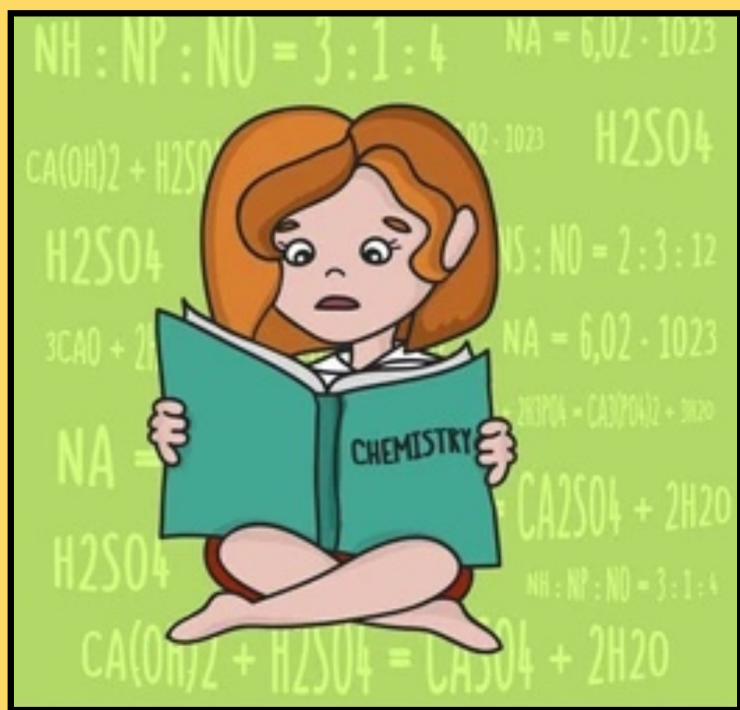


Radioactive materials



Human brain cell

A course in chemistry can be a fascinating experience,



It helps you to understand yourselves and your surroundings in everyday living.





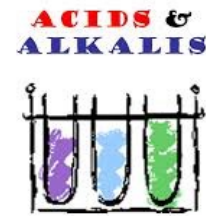
Agriculture



Food & Beverage



Medical industry



Acid&Alkali



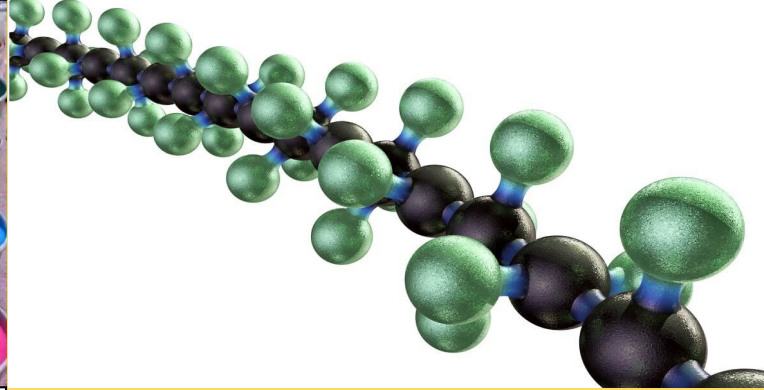
Soaps



Detergents



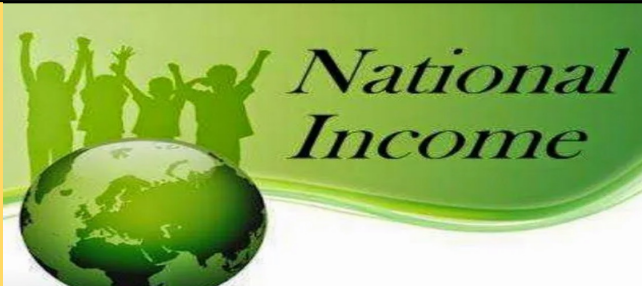
Dyes



Polymers



Metals



The economy of a nation



Generate employment

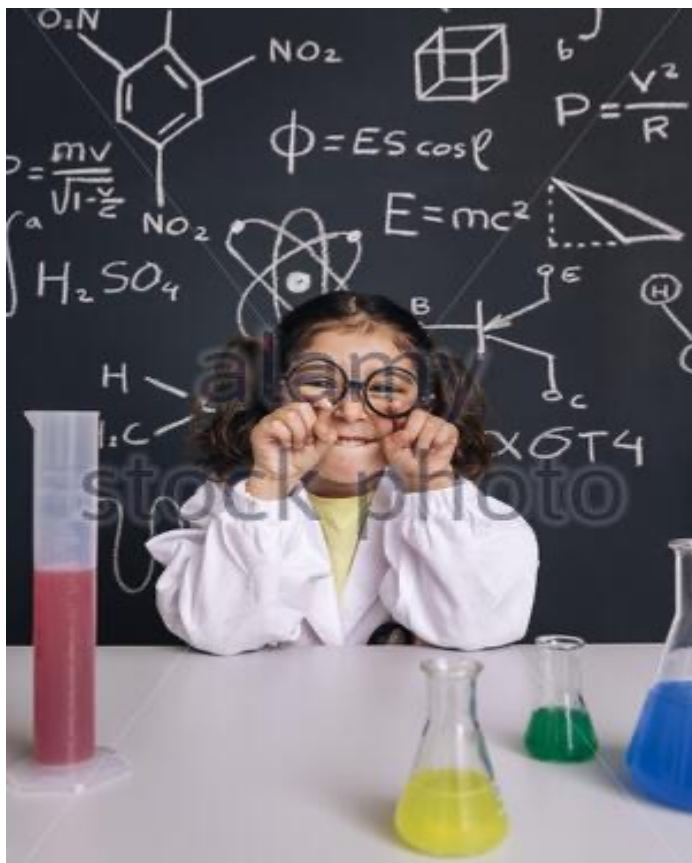
**Chemistry is also required
for many fields of study.**



Pharmacy & Medicine



**Cutting-edge of today's
digital technology**



**Understanding
basic chemistry and
chemical terms**



**Your material world
more meaningful**

Basic process skills

- observing**
- classifying**
- inferring**
- communicating (through diagram,graph,chart,etc.),**
- predicting**
- using numbers**

1.6 THE PRINCIPAL GOALS IN BASIC EDUCATION HIGH SCHOOL CHEMISTRY

SIX MAIN THEMES

- (1) Particulate nature of substances**
- (2) Periodicity**
- (3) Chemical calculations**
- (4) Chemistry of reactions**
- (5) The environment and**
- (6) Organic chemistry**

Thank You.

U Thura (B.E.)

CHAPTER 1

CHEMISTRY : THE CENTRAL SCIENCE

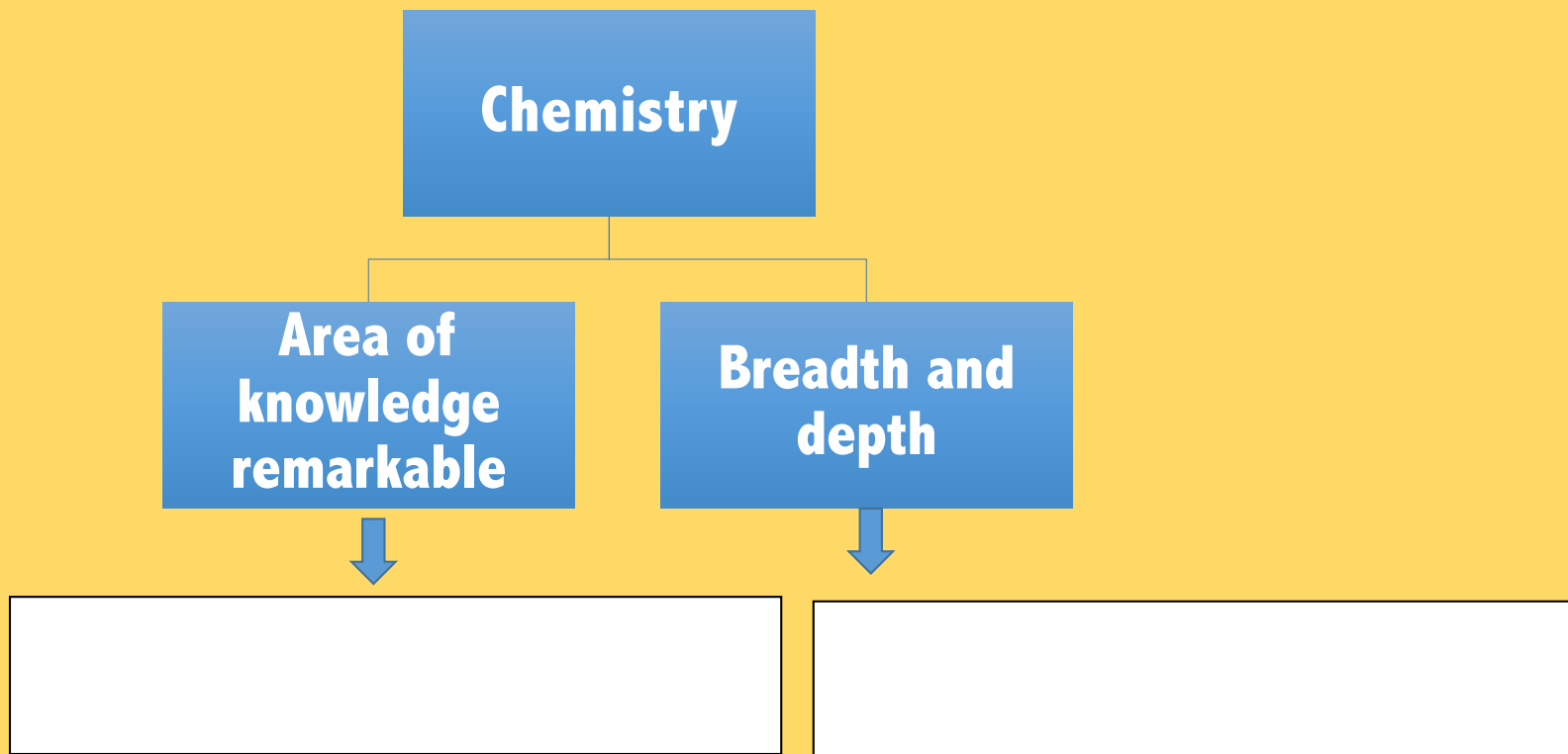


.....

.....

.....

1.1 CHEMISTRY AS CENTRAL SCIENCE



.....

..... **Parts**



.....

Knowledge of chemistry



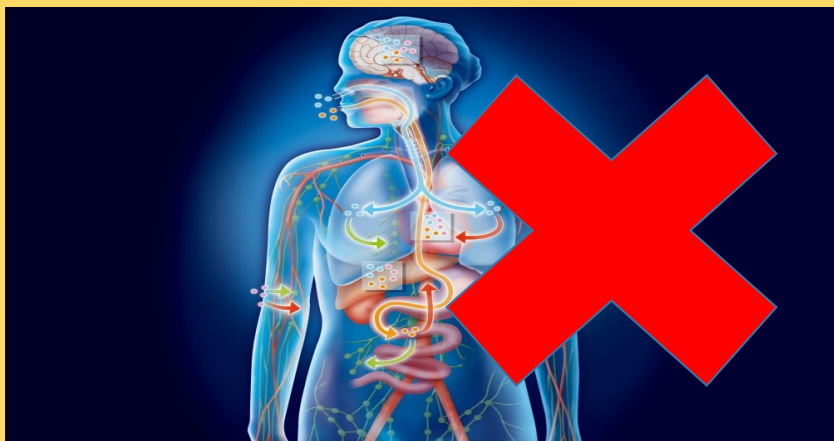


.....



All rely on





Societal issues

(လူမှု အဖွဲ့အစည်းနှင့်ဆိုင်သော
အကြောင်းကိစ္စများ)

MEDIA



Challenges





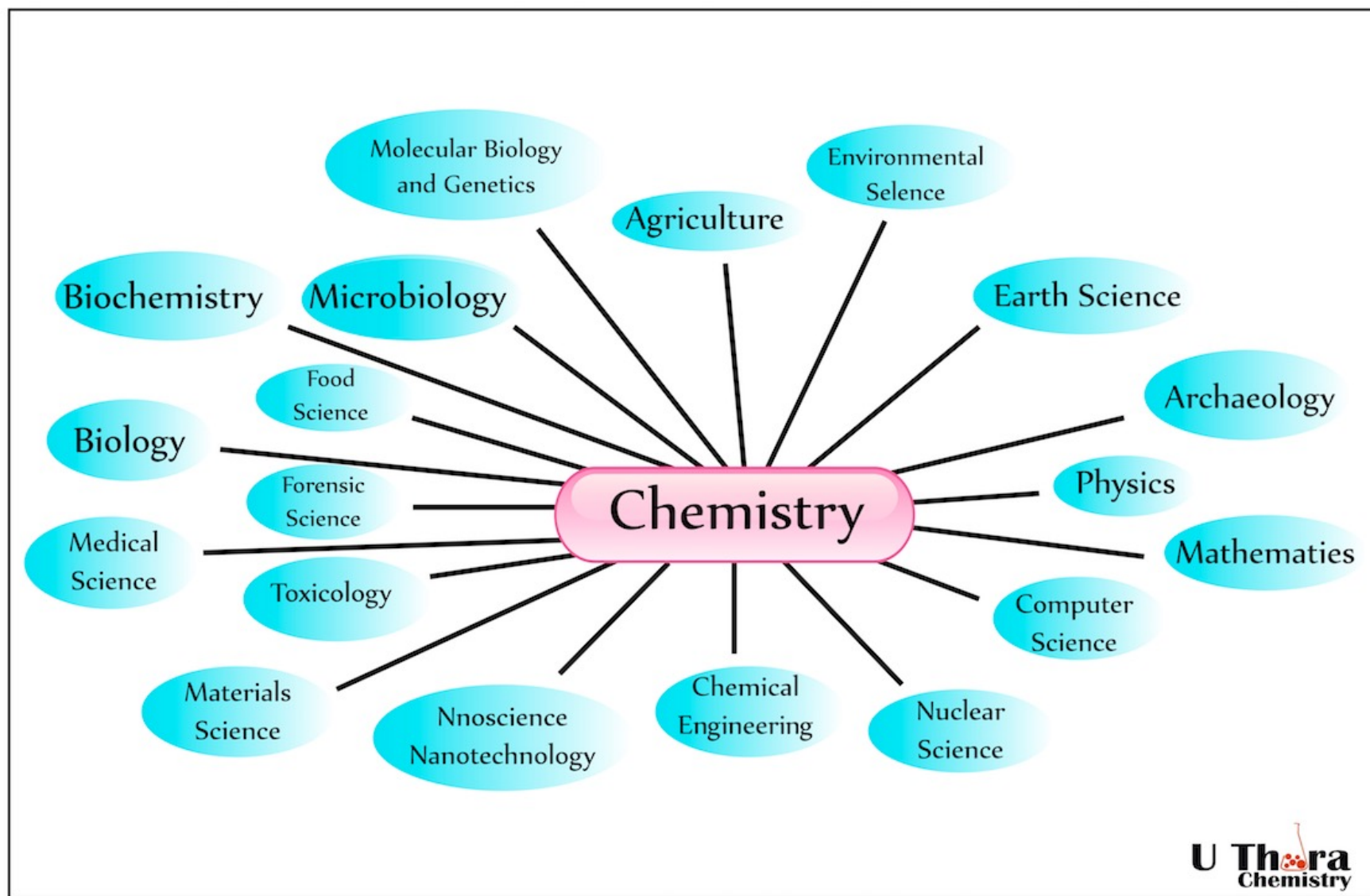
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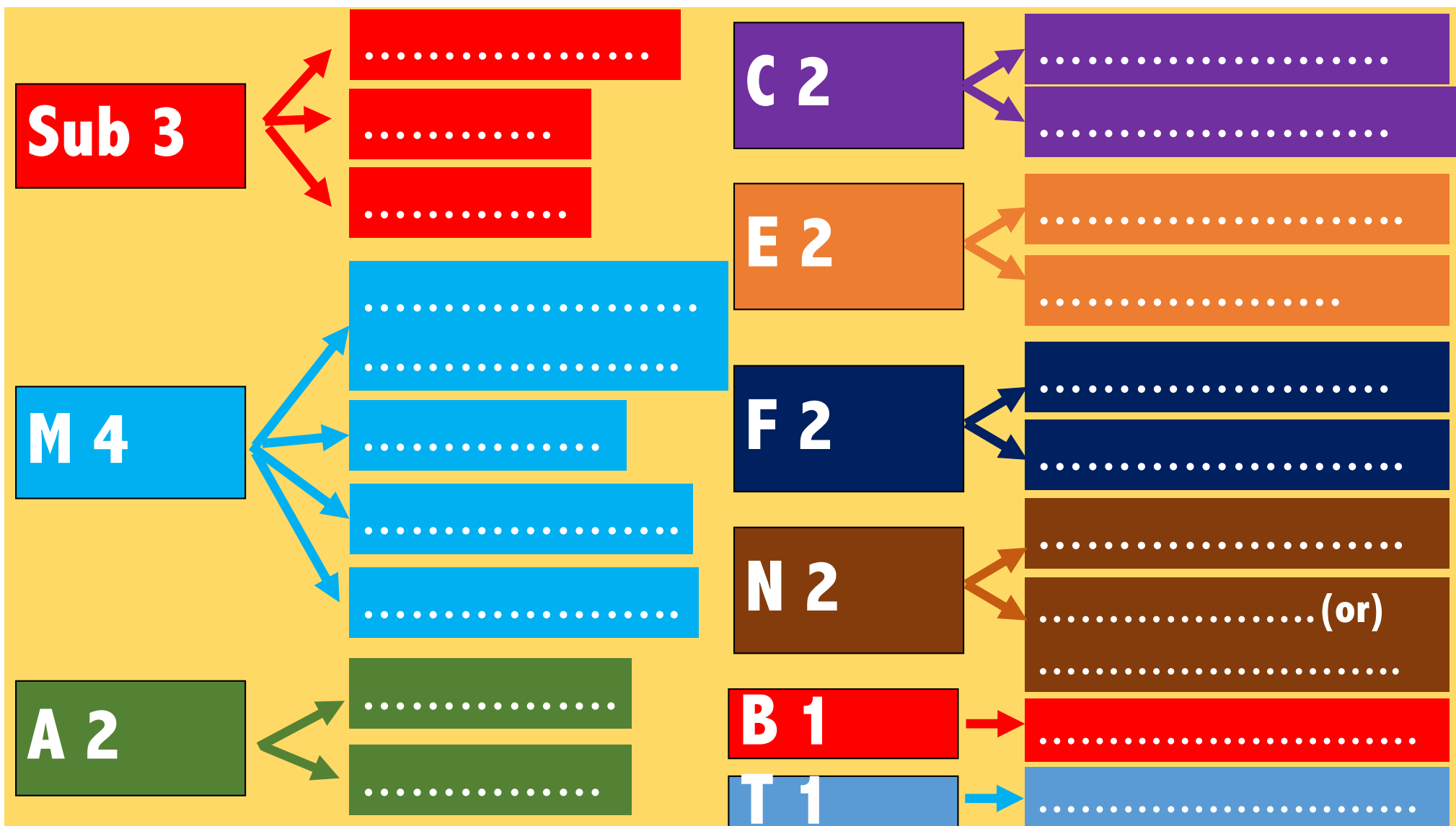


.....

CHEMISTRY

THE SCIENCE





?



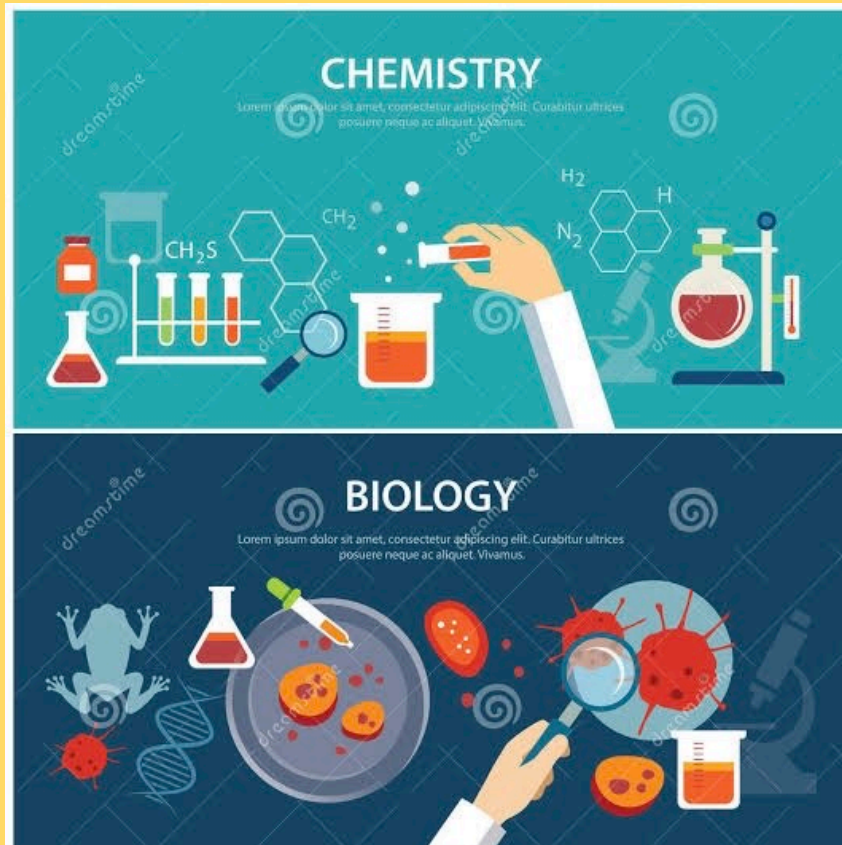
- Titration**
- Rate of reaction**
- Laws**
- Mole concept**
- Solubility**
- etc**

?



- Energy**
- Atom**
- Fundamental particles**
- etc**

?



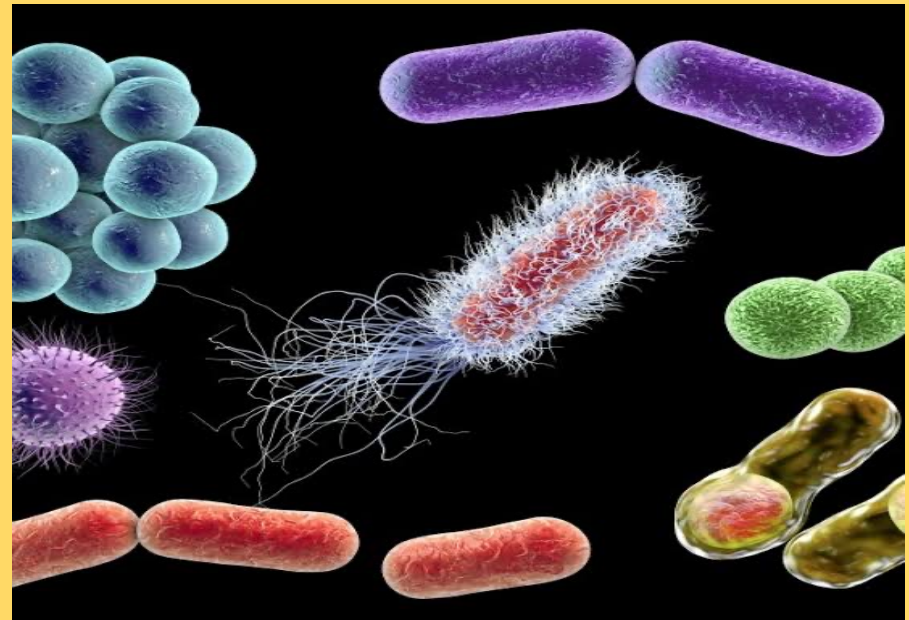
?



- DNA
- genes
- etc



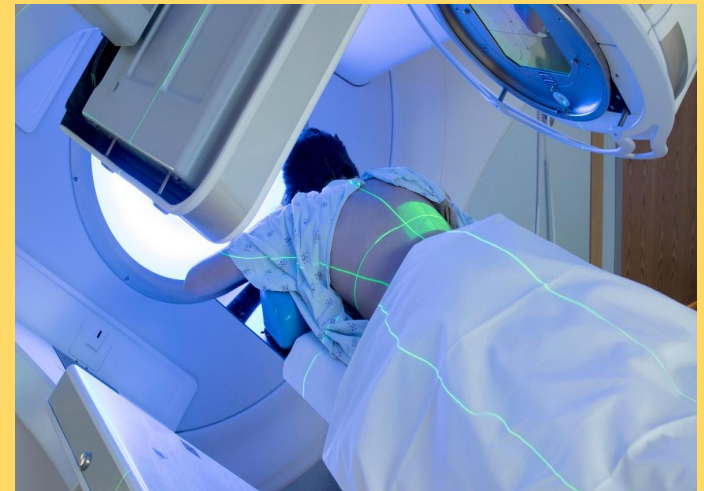
?



?



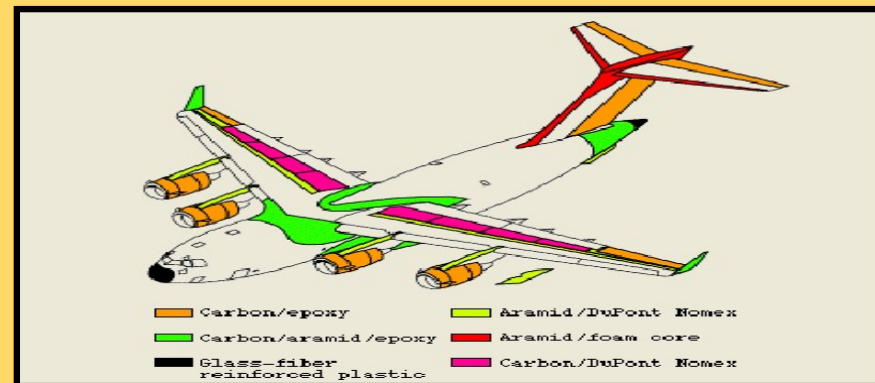
**-medicine
-vaccine
-radiotherapy
-etc**



?



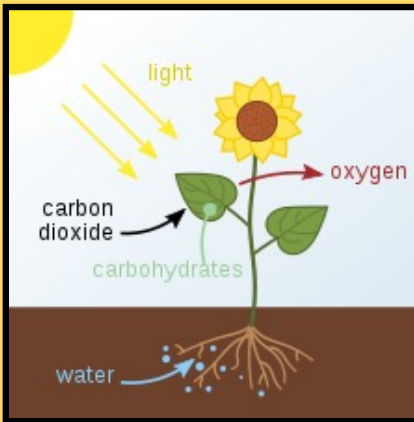
- Engineering
- Physics
- Chemistry
- Mathematics



?

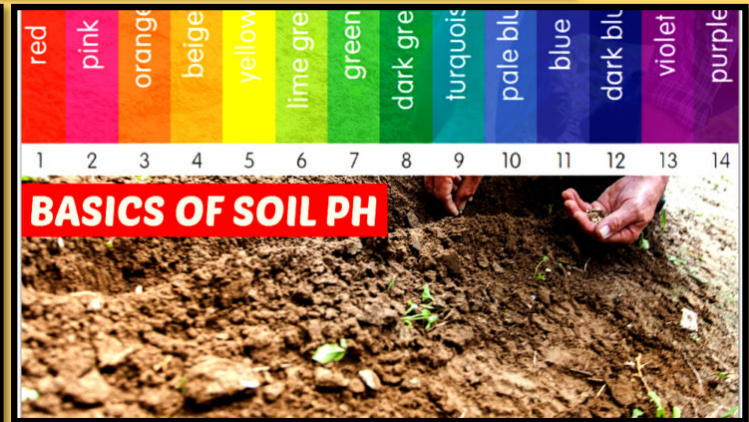


- Fertilisers
- Insecticides
- Pesticides
- Photosynthesis
- Plant hormone
- Soil reaction
- etc



Phytohormones
(Plant hormones)

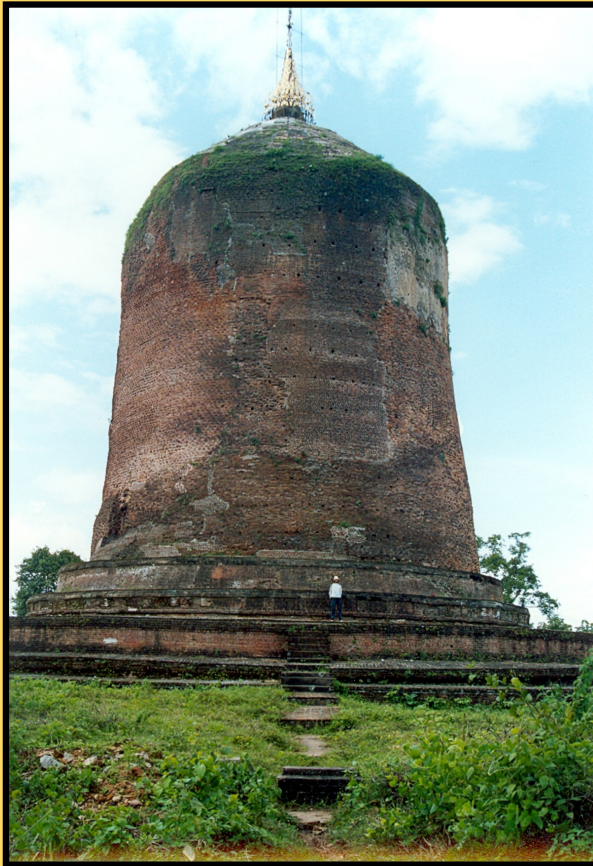
	Germination	Growth to Maturity	Flowering	Fruit Development	Abscission	Seed Dormancy
Gibberellin	✓	✓	✓	✓	✗	✗
Auxin	✗	✓	✓	✓	✗	✗
Cytokinins	✗	✓	✓	✓	✗	✗
Ethylene	✗	✗	✓	✓	✓	✗
Abscissic Acid	✗	✗	✗	✗	✓	✓



?



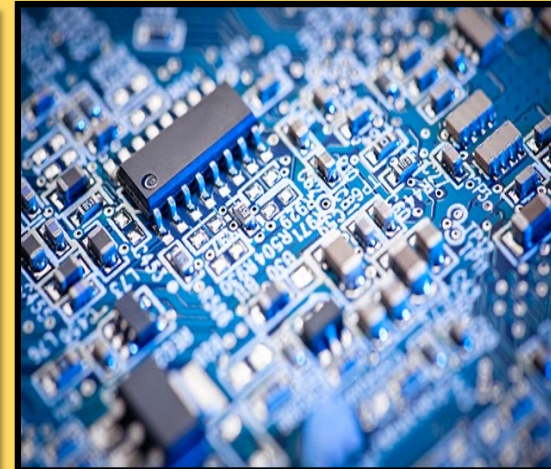
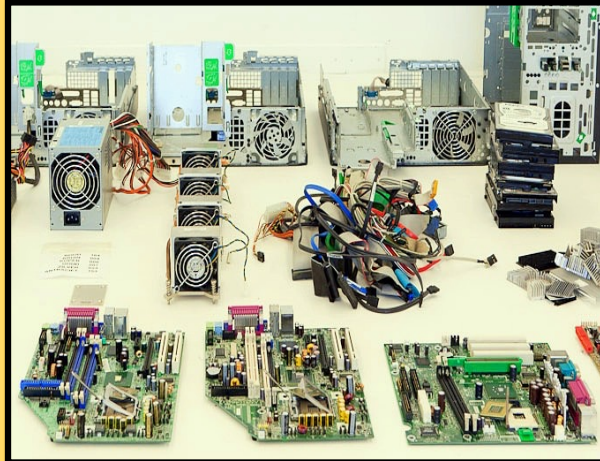
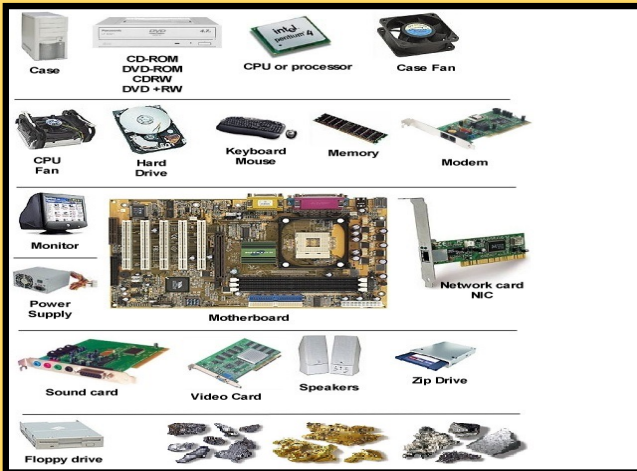
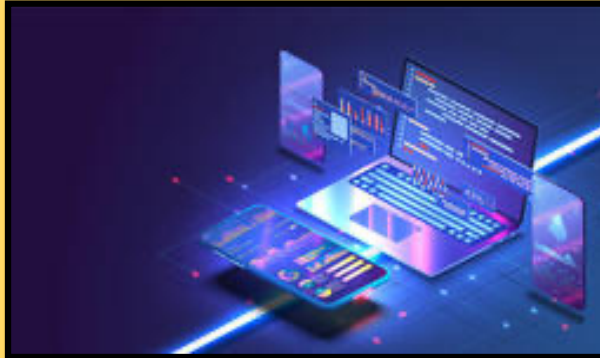
- Antique
- Architecture
- Biofacts
- Material culture
- etc



?



- metal
- non-metal
- metalloid
- etc



?



-Branches of engineering
-chemical products



?



- Atmosphere
- Water
- Soil
- Plant
- etc



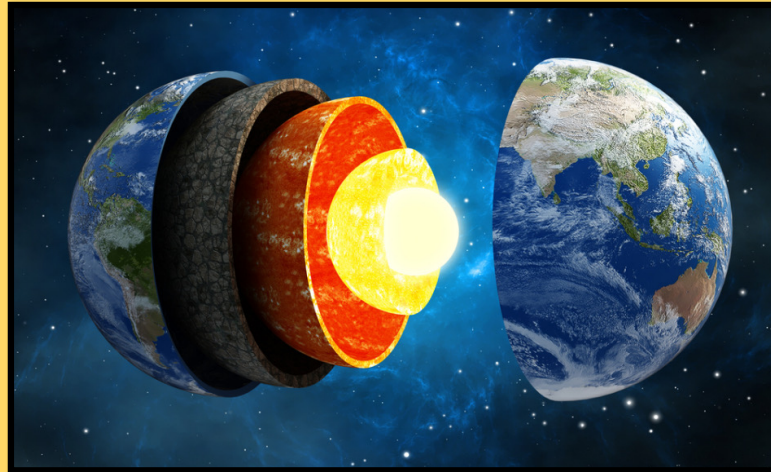
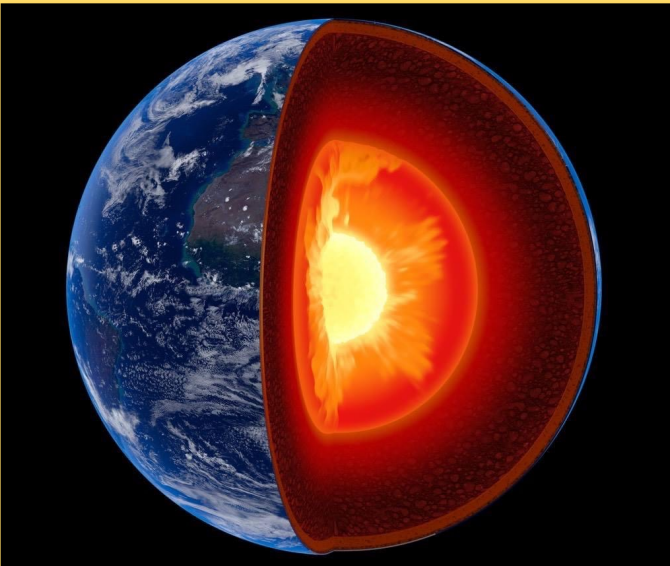
?



**-Physical and chemical
constitution of the
earth and its
atmosphere**



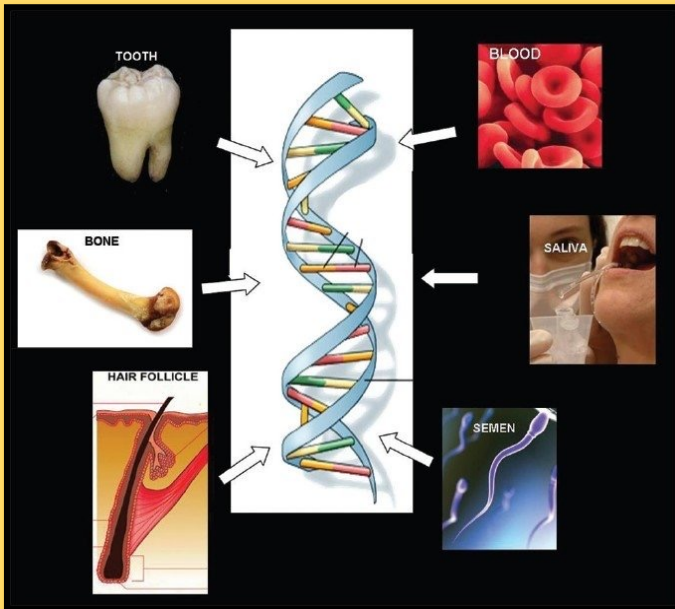
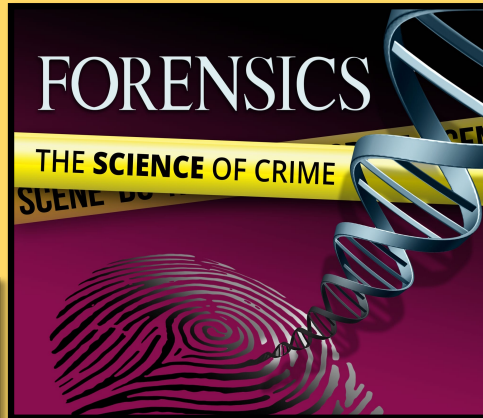
Earth
Science



?



- blood
- DNA
- gunpowder
- finger print
- etc



?



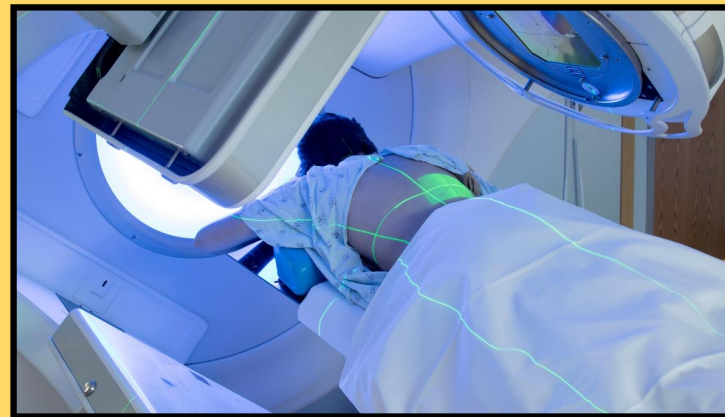
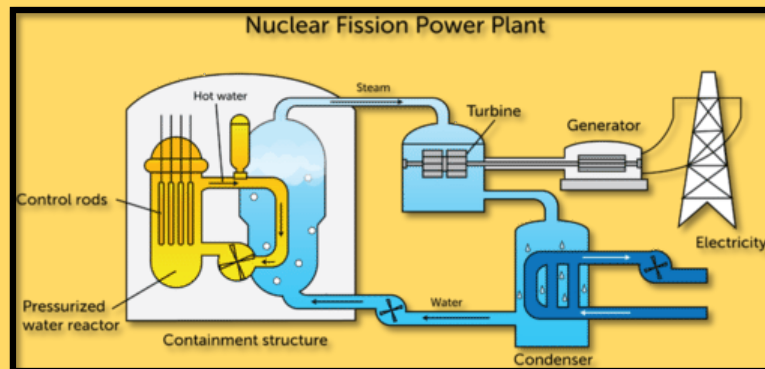
- combination of food chemical
- new food product
- flavour
- preservative
- dye



?



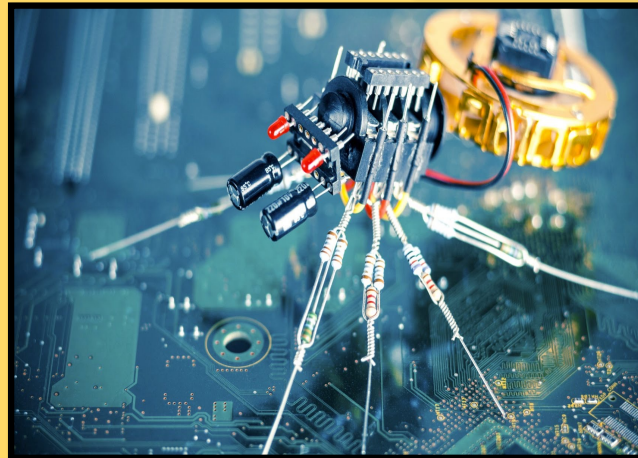
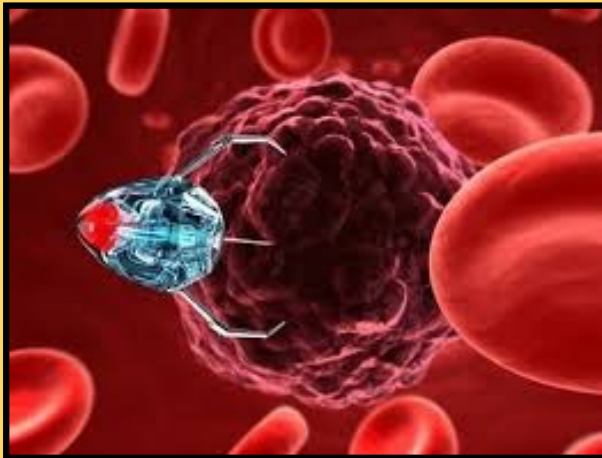
- Atomic bomb
- Electrical power
- Radiotherapy
- etc



?



- $\frac{1}{100,000,000}$
- **Ultra small scale**
- **DNA's diameter = 2.5nm**
- **RBC = 7000nm**



?



- **Branches of science**
- **Living organisms**
- **Chemical process**



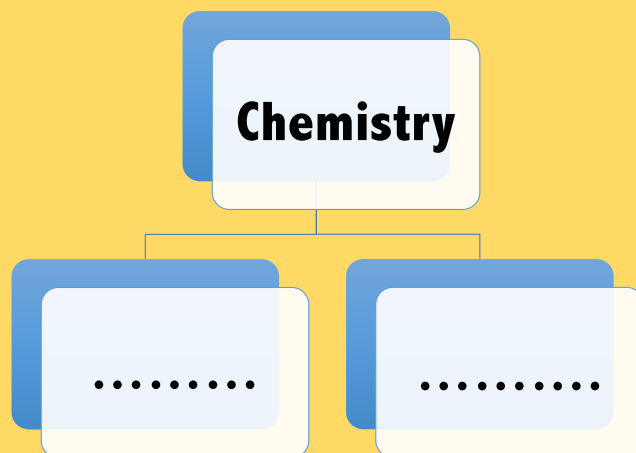
?



- **Toxic**
- **Pesticides**
- **Insecticides**

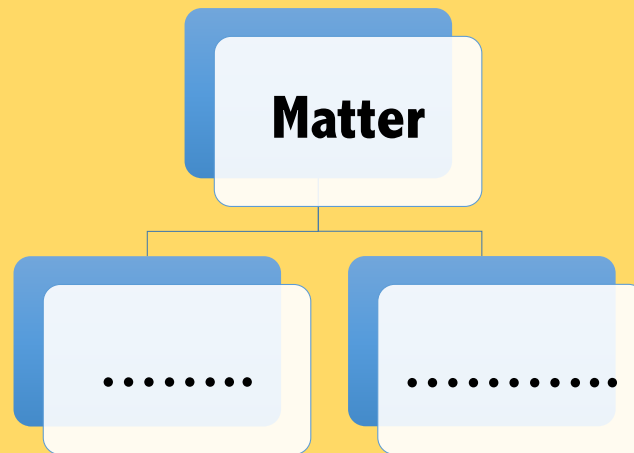


Q. Just what is chemistry anyway?



A. Chemistry is

Q. What is matter?



A. It is

We change matter to make it more useful.



.....

.....

We practice chemistry everyday.



We



We



We



We.....

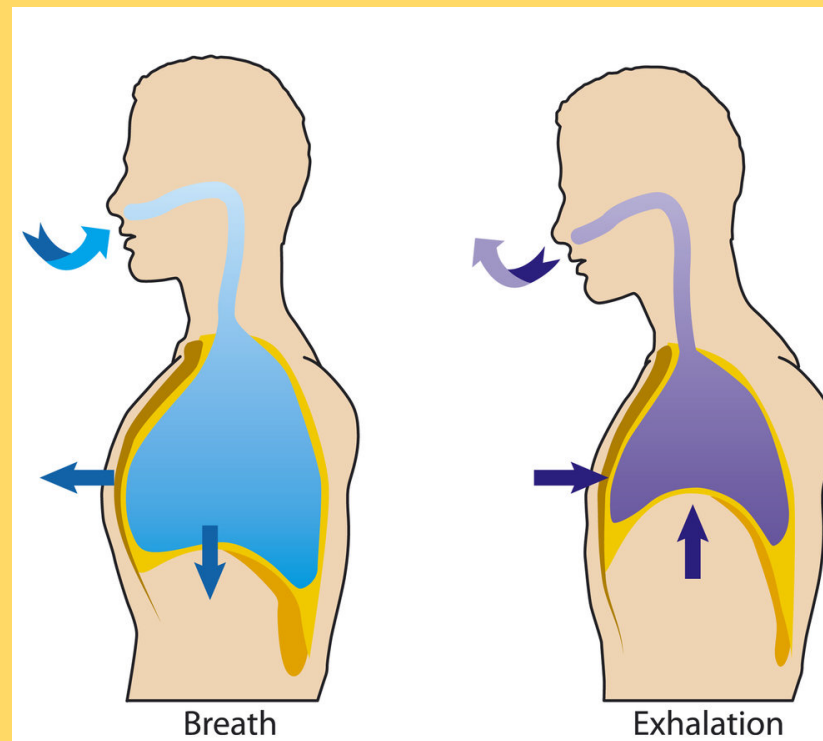


We



We

Our body takes from the air and combines it with part of the we eat to provide us withfor everyday activity we undertake.



Q. So what is chemistry ?

**A. It is a that touches our life every moment . It deals with fromto the
It goes beyond the to affect, shaping our**

