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SCIENCE PARK

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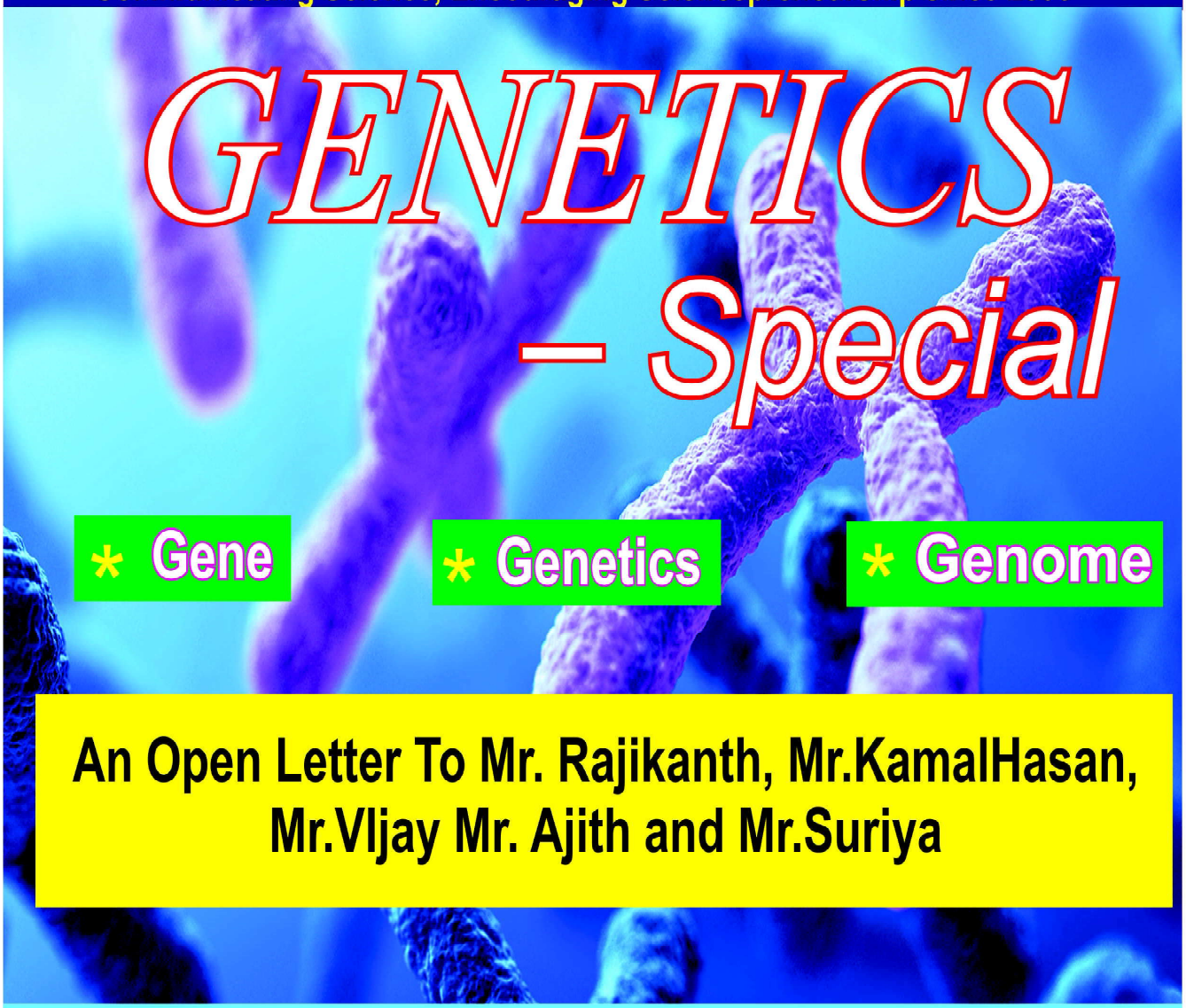
Communicating Science, Encouraging Sciencepreneurship since 2006



GENETICS – Special

* Gene
* Genetics
* Genome

An Open Letter To Mr. Rajikanth, Mr.KamalHasan, Mr.Vljay Mr. Ajith and Mr.Suriya

JANUARY Vol . 18 Issue : 3

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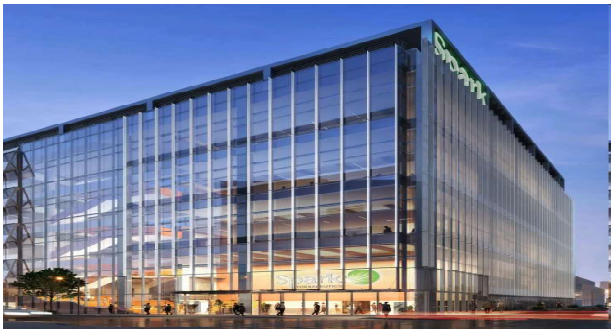
Feature Article



Spark Therapeutics

An Open Letter To Rajinikanth, KamalHasan, VIjay, Ajith & Surya

Make a Corpus Fund of Rs. 1000 Crore for Investment in Tamil Nadu-based Startup Companies with Mentorship Support

As you are aware, both the Central and State Governments have been diligently working to bolster our economy, and the current Tamil Nadu Government has set a bold target to elevate the state into a USD $1 Trillion Economy.

Despite concerted efforts from government bodies, public sector banks, and corporations, the capacity to generate employment opportunities for all remains a challenge. Entrepreneurship emerges as a vital solution to combat our prevailing unemployment woes.

Every year, Tamil Nadu, Kerala, and Karnataka collectively produce approximately half a million engineers. However, financial institutions encounter difficulties in funding and recovering educational loans from this demographic. Despite possessing technical expertise, many of our youth lack the requisite mentorship and guidance necessary to transform their technical prowess into successful entrepreneurial ventures.

The coastal expanse of Tamil Nadu harbors untapped potential, particularly in Ship Building and dismantling. Our ancestral lineage boasts remarkable accomplishments in Civil Engineering, evident in the construction of the world-class Irrigation Dam at Kallanai. We have historically excelled in Architecture, manifest in the renowned Temples of Thanjavur, Krishnapuram, and Ayvoudayarkoil in Pudukkottai District. The tourism sector presents an opportunity to cultivate numerous entrepreneurs.

Furthermore, Tamil Nadu presents significant startup potential across various sectors including Agriculture, Food Processing, Leather, Textile, and Handmade Toys.

SCIENCE PARK humbly requests your support in establishing a Venture Capital fund of Rs. 1000 Crores dedicated to investing in Tamil Nadu-based Startup Companies. Many existing VC funds lack a comprehensive mentoring framework for their beneficiaries, leading to the failure of several promising enterprises.

The younger generation seeks opportunities for growth rather than mere handouts. By investing in Tamil Nadu-based startups and providing crucial mentorship, we can foster an environment where our state thrives.I sincerely hope that you will consider this proposal and contribute to the development of Tamil Nadu's entrepreneurial ecosystem.

L.Krishnamoorthy
editor, Science Park Magazine

Genetic Engineering

In biology the study of heredity is called genetics.

Heredity is when certain traits are passed from the parents to the children. Traits are characteristics such as eye color, height, and athletic ability. Heredity is passed through genes in the DNA molecule.

Genetics is the study of the ways in which different characteristics are passed from each generation of living things to the next.

Genetics has many divisions like ***Human Genetics, Plant Genetics and Animal Genetics.***

Human Genetics

Genetics is the scientific study of inherited variation. Human genetics, then, is the scientific study of inherited human variation. Human Genetics gives us a powerful tool for understanding and describing human evolution.Human genetic variation does exist: It is real and measurable.

Plant Genetics

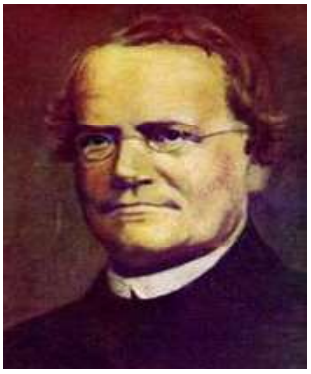
Plant genetics is the study of genes, genetic variation, and heredity specifically in plants. Plant genetics is similar in many ways to animal genetics.

Father of Genetics

(Gregor Johann Mendel 1822-1884)

The field of plant genetics began with the work of Gregor Johann Mendel, who is often called the "**father of genetics.** An Austrian Monk who was also a scientist is considered to

be the father of Genetics. He discovered the basic principles of heredity through experiements in his garden. Mendel's observations became the foundation of modern genetics and the study of heredity and he is widely considered a pioneer in the field of genetics Mendal began to research the transmission of hereditary traits in plant hybrids.



Johann Mendel

Basic Principles of Genetic Engineering

The basic principle of genetic engineering is gene transfer, achieved by various methods to produce recombinant proteins genetically

modified microorganisms, transgenic plants and transgenic animals for commercial applications, genetic engineering thus ultimately influences the growth of biotech industries.

The two significant feature of genetic engineerng is producction of beneficial protein and enzymes in surplus quantities and cration of transgenic plants and animals and Genetically modified miroorganisms with new characters eneficial for themselves using recombinant DNA technology. The discovery of a new protein either with a therapeutic propertor applications in food industry by a researcher or scientist would not have reached humans for the use by humans without the applications of genetic engineering in mass producing such protein.

"CRISPR" (pronounced "crisper") stands for Clustered Regularly Interspaced Short Palindromic Repeats, which are the hallmark of a bacterial defense system that forms the basis for CRISPR-Cas9 genome editing technology. In the field of genome engineering, the term "CRISPR" or "CRISPR-Cas9" is often used loosely to refer to the various CRISPR-Cas9 and -CPF1, (and other) systems that can be programmed to target specific stretches of genetic code and to edit DNA at precise locations, as well as for other purposes, such as for new diagnostic tools. With these systems, researchers can permanently modify genes in living cells and organisms and, in the future, may make it possible to correct mutations at precise locations

in the human genome in order to treat genetic causes of disease. Other systems are now available, such as CRISPR-Cas13's, that target RNA provide alternate avenues for use, and with unique characteristics that have been leveraged for sensitive diagnostic tools, such as SHERLOCK.


Ruud Jansen

Francisco Mojica was the first researcher to characterize what is now called a CRISPR locus, reported in 1993. He worked on them throughout the 1990s, and in 2000, he recognized that what had been reported as disparate repeat sequences actually shared a common set of features, now known to be hallmarks of CRISPR sequences (he coined the term CRISPR through correspondence with Ruud Jansen, who first used the term in print in 2002).


Francisco Mojica

What is DNA & it structure

Deoxyribonucleic acid. The molecules inside cells that carry`genetic information and pass it from one generation to the next. Each and every human being has a unique set of chemical blueprints that determine how our body functions. These blueprints are contained in our DNA, which is Deoxybonucleic acid. The DNA molecule consists of two strands that wind around one another to form a shape known as a double helix. Each strand has a backbone made of alternative sugar and Phosphat groups. Attached to each sugar is one of four bases Adenine (A), Cytosine(C), Guanine (G) and thymine (T) . The two strands are held together by bonds between the bases , adenine bonds with thymine and cytosine bonds with guanine. The sequence of these four bases determines each genetic code.

The sequence of the bases along the backbones serves as instructions for assembling protein and RNA molecules.

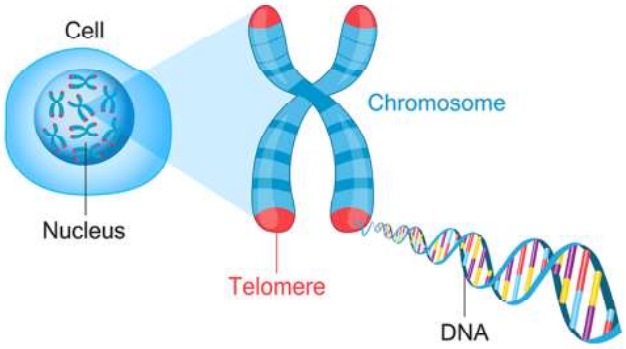
The instructions for constructing and maintaining cells are build into this molecule.

DNA can copy itself so that all the new cells produced by a plant or animal ontain copies of the same set of genetic instructions or genetic code.

The segments of DNA that contain the instructions for making specific body proteins are called Genes. Scientists believe that human DNA carried about 25000 protein coding genes.

Each gene may be thought of as a recipe you would find in cookbook. Some are recipes for creating physical features like brown eyes or curly hair. Others are receipes to tell the body how to produce important chemicals called enzymes (which help control the chemical reactions in the body)

What is Chromosomes ?



Along the segments of our DNA, genes are neatly packaged within structures called chromosomes. Every human cell contains 46 chromosomes arranged as 23 pairs (called autosomes) with one memember of each pair inherited from each parent at the time of conception. After conception the chromosomes duplicate again and again to pass on the same genetic information to each new cell in the developing child. Twenty-two autosomes are the same in males and females. In addition, females have two X Chromosomes and males have one X and one Y Chromosome. The X and Y are known as sex chromosome

Sex Chromosomes

Genetic Problems also occur when abnormalities affect the sex chromosomes. Normally a child will be male if he inheritis one X chromosome from his mother and one Y Chromosome from his father. A child will be a female if she inheritis a double dose of X (one from

each parent) and no Y.

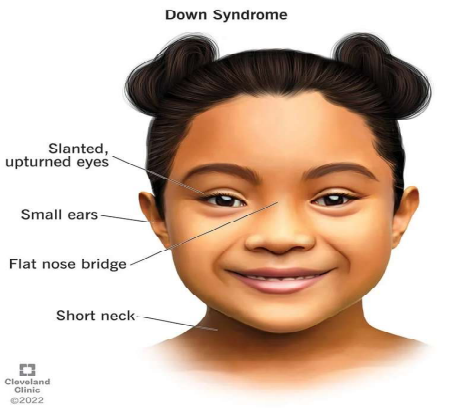
Sometimes, however children are born with only one sex chromosome (usually a single X) or with an exgra X or Y . Girls with Turner syndrome are born with only one X Chromosome, whereas boys with Klinefeler syndrome are born with 1 or more extra X Chromosomes (XXX or XXXY)

Somotimes, too a genetic problem ix X linked meaning that it is associatd with an abnormality carried on the X chromosome. Fragile X syndrome which causes intellectual disability in boys , is one such disorder. Other diseases that are cuased by abnormalities on the X chromosomes include hemophilia and Duchenne muscular dystrophy.

Females may be carriers of these diseases, but because they also inherit a normal X Chromosome the effects of the gene change on the affected X is minimized. Males on the other hand only have one X Chromosome and are almost always the ones who have the substantial effects of the X linked disorder.

Abnormal Numbers of Chromosomes

When a mistake occurs during cell division. It can cause an error in the number of Chromosomes a person has. The developing embryo then grows from cells that have either too many chromosomes or not enough.



In trisomy, for example there are three copies of one particular chromosome instead of the normal two (one from each parent) . Trisomy 21 (Down syndrome), Trisomy 18 (Edwards Syndrome)and trisomy 13 (Patau syndrome) are examples of this type of genetic problem.

Trisomy 18 affects 1 out of every 7500 births. Children with this syndrome have a low birth weight and a small head, mouth and jaw. Their hands typically from clenched fists with finders that overlap. They also might have malformations involving the hips and feet heart an kidney problems and intelectual disability (

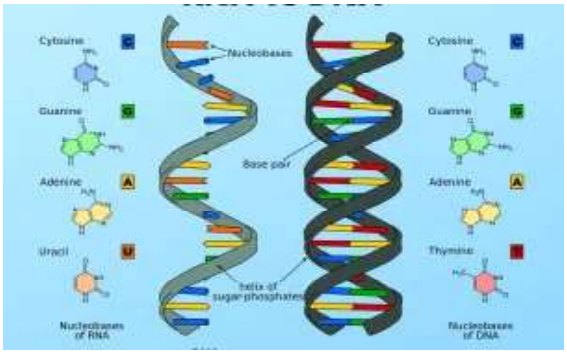
also called mental retardation) Only about 5% of these children are expected to live longer than 1 year.

Human Chromosomes are large enough to be seen with a high powered microscope and the 23 pairs can be identified according to differences in their size, shape and the way they pick up special laboratory dyes.

Trisomy 13 affects 1 out of every 15000 to 25000 births. Children with this condition often have cleft lip and palate, extra fingers or toes., foot abnormalities and may different structural abnormalities and many different structural abnormalities of the skull and face. This condition also can cause malformations of the ribs, heart, abdominal organs and sex organs. Long erm survival is unlikely but possible.

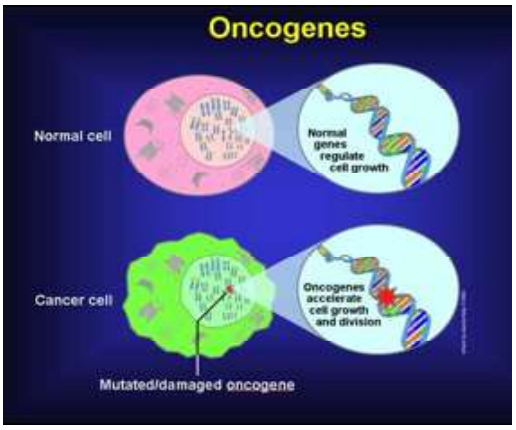
In monosomy another form of numericla error, one member of a chromosome pair is missing. So there are too few chromosomes rather than too many.

What is a Genetic Code?



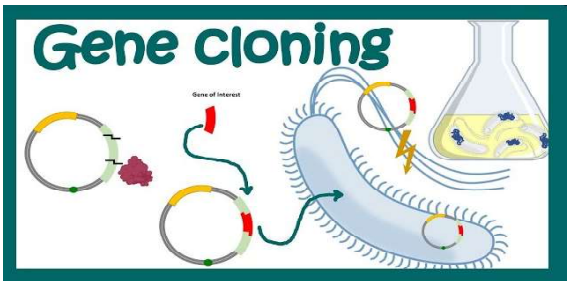
The genetic code can be defined as the set of certain rules using which the living cells translate the information encoded within genetic material (DNA or mRNA sequences). The ribosomes are responsible to accomplish the process of translation. They link the amino acids in an mRNA-specified (messenger RNA) order using tRNA (transfer RNA) molecules to carry amino acids and to read the mRNA three nucleotides at a time. The instructions in a gene that tell the cell how to make a specific protein. A, C, G and T are the letter of the DNA code, they stand for the chemicals adenine (A) , cytosine (C), guanine (G) and Thymine (T) respectively that make up the nucleotide bases of DNA. Each Gene's code combines the four chemicals in various ways to spell out three letter words that specifiy which amino acid is needed at every step in making a protein.

Cancer Causing Gene (Oncogenes)



Cancers are caused by damage to the DNA in your cells. These changes are called "gene mutations.Researchers have identified about 50 cancer causing genes that greatly increase a person's odds of developing cancer. By using spohisicated screening tools, docotors may be able to identify who has these genetic mutations and determine who is at risk. For example scientists have identified that colorectal cancrer is sometimes associated with mutations in a gene called APC. They have also discovered that abnormalities in the BRCA1 AND brca2 Gene give women a 50% chance of developing breast cancer and an increased risk for ovarian tumors.

Cloning



Scientists have explored cloning technology for several reasons. Some use cloned animals to study and fight deadly diseases.

The term cloning describes a number of different processes that can be used to produce genetically identical copies of a biological entity. The copied material, which has the same genetic makeup as the original, is referred to as a clone. Researchers have cloned a wide range of biological materials, including genes, cells, tissues and even entire organisms, such as a sheep.

Father of Cloning

Cloning is a method that scientists use to produce a genetic copy of another individual. In other words, Dolly was a clone of her mother.In 1997, a 7-month-old sheep named Dolly became a celebrity. Dr. Ian Wilmut, a Scottish scientist, announced to the world that he had created her using a procedure called cloning. Actually, Dolly had three mothers. One mother gave Dolly her DNA, one mother supplied an egg, and the third mother, her surrogate mother, gave birth to her.

DNA Replication

The use of existing DNA as a template for the synthesis of new DNA strands. In humans and other eukaryotes, repliation occurs in the cell nucleus.

Double Helix

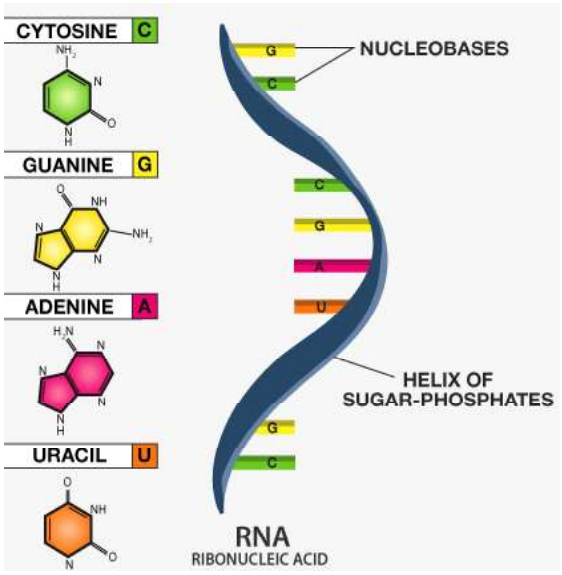
The shape that two linerar strands of DNA assume when bonded together.

E Coil

E. coli is a type of bacteria that normally lives in the intestines, where it helps the body break down and digest food.

Some types (or strains) of E. coli, though, are infectious (causing infections that can spread to others). They spread through contaminated food or water, or from other infected people or animal

Ribonucleic Acid (RNA)



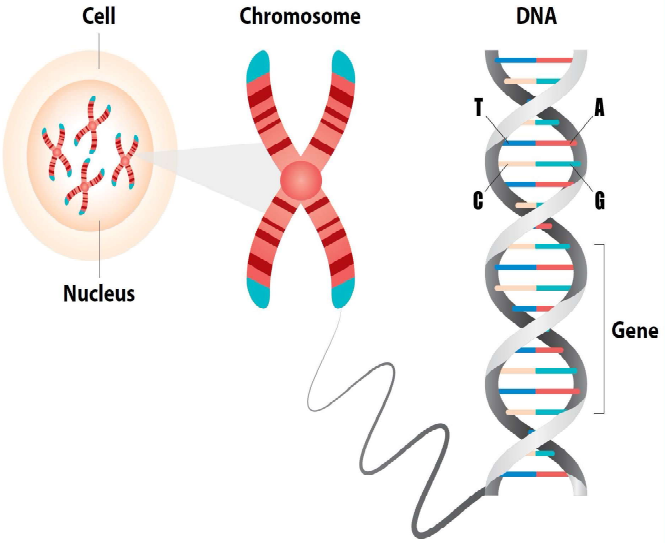
RNA is a ribonucleic acid that helps in the synthesis of proteins in our body. This nucleic acid is responsible for the production of new cells in the human body. It is usually obtained from the DNA molecule.mRNA, rRNA, and tRNA are the three main types of RNA involved in protein synthesis. RNA also serves as the primary genetic material for viruses.

Other functions include RNA editing, gene regulation, and RNA interference.

Gene Testing

Genetic tests are done by analysing small samples of blood or body tissues. They determine whether you, your partner or your baby carry genes for certain inherited disorders.

Genetic testing has developed enough so that doctors can often pinpoint missing or defective genes. The type of genetic test needed to make a specific diagnosis depends on the particular illness that a doctor suspects.



Many different types of body fluids and tissues can be used in genetics testing For deoxyribo nucleic acid (DNA) screening, only a very tiny bit of blood, skin , bone or other tissue is needed.

Ribosome. A ribosome is the cellular machinery responsible for making proteins.

What is Genome ?

The term genome was created in 1920 by Hans Winkler. The genome is the entire set of DNA instructions found in a cell. In humans, the genome consists of 23 pairs of chromosomes located in the cell's nucleus, as well as a small chromosome in the cell's mitochondria. A Genome can also contain elements that are not inherited like viruses.

Your genome is your unique collection of genes. It's responsible for what you look like — and it's what provides every part of your body with the instructions needed to perform the functions that help you grow and live.

Genomics is the study of a person's collection of genes and how they work together. It's like looking at how the parts of the engine work together to make the car drive.

Genetic Disorders

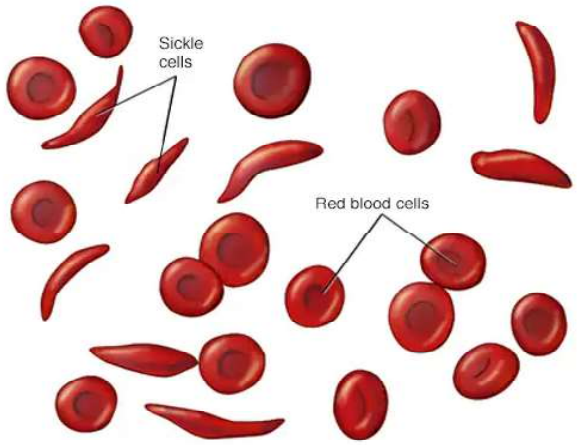
About 7000 disorders of human have recognized genetic basis. The Genetic disorders affects 1 an 2 percent the human population (that is more than one in every 100 children born carriers a serious genetic defect. More than half of the genetic diseases are due to a mutation

involving a single gene. The mutant allele may be recessive or dominant and may be found on autonomic chromosome or aon the sex chromosome.

Some examples of genetic diseases are narrated below:

Sickle cell disease

It is a genetic disorder in which red blood cells contort into a sickle shape. The cells die early, leaving a shortage of healthy red blood cells (sickle cell anemia) and can block blood flow causing pain (sickle cell crisis).



A group of disorders that cause red blood cells to become misshapen and break down.Treatments include medication, blood transfusions and rarely a bone-marrow transplant.

Canavan disease

Canavan disease is a rare inherited disorder that damages the ability of nerve cells (neurons) in the brain to send and receive messages. This disease is one of a group of genetic disorders called leukodystrophies. Leukodystrophies disrupt the growth or maintenance of the myelin sheath, which is the covering that protects nerves and promotes the efficient transmission of nerve impulses.

Mutations in the ASPA gene cause Canavan disease. The ASPA gene provides instructions for making an enzyme called aspartoacylase

Haemophilia

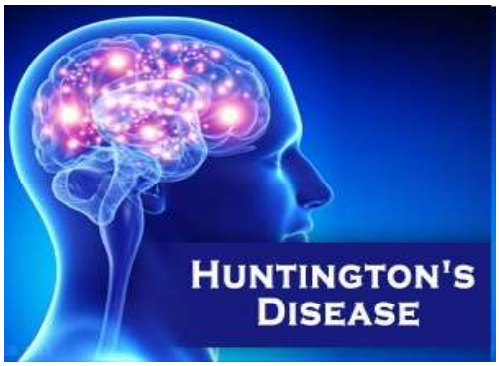
Haemophilia is an inherited bleeding disorder, which means it can be passed on from birth parents to their children.When a blood vessel is injured, special proteins in the blood called

'clotting factors' act to control blood loss by plugging or patching up the injury.

The main symptoms of haemophilia are easy bruising, having large bruises, and greater than normal bleeding from surgery or menstruation.

There is no cure for haemophilia, but heavy bleeding can be controlled with medical treatment.

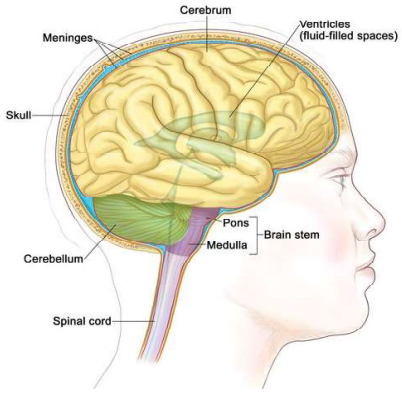
Huntington's disease



Huntington's disease is an inherited condition that affects the nervous system. Although Huntington's disease can occur at any age, symptoms often do not appear until your 40s or 50s.

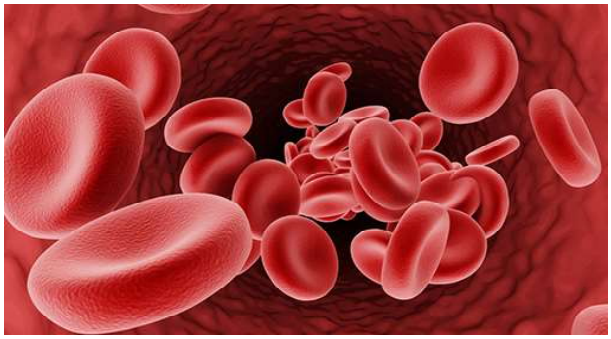
Huntington's disease is progressive, meaning it worsens over time. While there is no cure, treatment can ease symptoms and support is available.

Tay-Sachs disease



Tay-Sachs disease is a genetic disorder that causes permanent brain damage.Children with Tay-Sachs disease usually die by the age of 5.n Australia, there are genetics screening programs offered for high school students of Ashkenazi Jewish heritage, who have a one in 25 likelihood of being carrying a faulty HEXA gene.

Thalassaemia



Thalassaemia is an inherited genetic disorder that affects the blood and causes lifelong anaemia.

People with thalassaemia do not produce enough healthy haemoglobin, which makes their

blood cells small and pale. Haemoglobin is a protein found in red blood cells that carries oxygen from the lungs to the rest of the body.

People born with thalassaemia cannot move oxygen around the body properly. Depending on the type of thalassaemia they have, they may need regular blood transfusions to stay alive.

Conquering Genetic Diseases

What is Gene therapy ?

Researchers believe that every human has about 25000 genes per cell. A mutation of change, in any one of these genes can result in a disease, physical disability or shortened life span.

These mutations can be passed from one generations to another, and inherited just like a mother's curly hair or a father's brown eyes. Mutations also can occur spontaneously in some cases without having been passed on by a parent.

Gene therapy techniques allow doctors to treat a disorder by altering a person's genetic makeup instead of using drugs or surgery.

Gene therapy is the use of DNA as a drug to treat such diseases. Put simply it introduces a good gene into a person who has a disease caused by a bad gene.

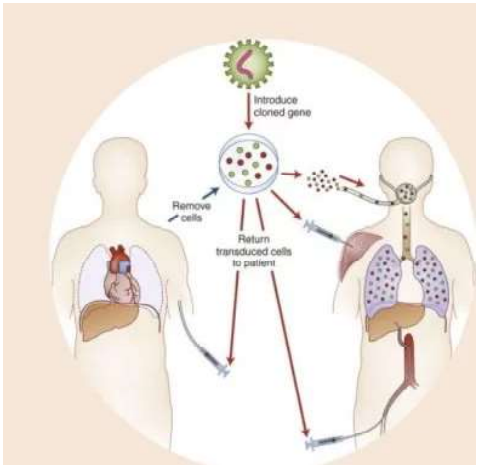
Once inside, the good gene produces proteins that help to cure the disease. Gene therapy carries the promosie of cures for many diseases and for types of medical treatment that did not seem possible until recently.

What is somatic Gene Therapy ?

Somatic gene therapy involves introducing a good gene into specific cells to treat the patients but not the patient's future children, because these genes do not get passed along

to the next generation.

In other words, even though some of the patient's genes may be altered to treat a disease, it won't change the chance that the disease will be passed on to the patients children. This is the mor common form of gene therapy being done.



Somatic gene therapy

Germline gene therapy

The second type of gene therapy is germline gene therapy . This involves modifying the genes, which will then pass any genetic changes to future generaions. Germline cells are the reproductive cells. Gene therapt that uses germline cells can result in permanent solutions that are passed on to subsequent generations.

In human germline therapy genetic changes are introduced into early embryos and these changes become incorporated into all cells of the body. As a result, such changes are passes on to future generations.

Germline gene therapy can therefor be of great value in treating hereditary diseases and preventing such diseases from being passed on.

Turn on a gene to help fight a disease.

Turn off a gene that is functioning improperly.

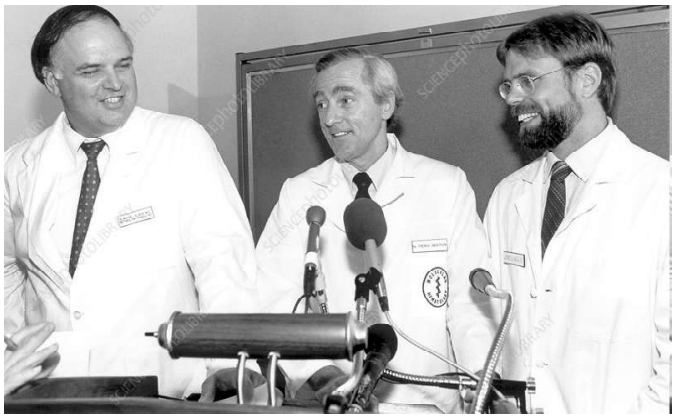
Remove a piece of DNA that is impairing gene function and causing disease.

Most of the existing gene therapy treatments and experiements are all Somatic. In somatic gene therapy the patients gene therapy is changed but the change is not passed along to the next generation.

Germline gene therpay is not being actively investigated in larger animals and humans for safety and ethical reasons.

First Gene Therapy

First gene therapy happened in USA in 1990. The Patient Ashanti De silva was suffering from Adenosine Deaminase Deficiency (ADA- SCID) . This deficiency made her vulnerable to even the mildest infections.

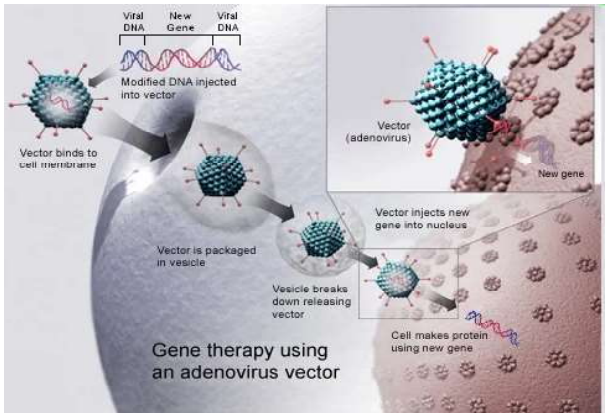


Dr.W.Frency Anderson of the National Heart,Lung and Blood Institute and Dr.Michael Blaese and Dr.Kenneth Culver, both of the National Cancer Institute performed the historic medical experiment.

Gene therapies are being used to treat a small number of diseases, including an eye disorder called Leber congenital amaurosis and a muscle disorder called spinal muscular atrophy. Many more gene therapies are undergoing research to make sure that they will be safe and effective.

Challenges In Gene Therapy

Gene therapy poses one of the greatest technical challenges in modern medicine. It is very hard to introduce new genes into cells of the body and keep them working. And there are financial concerns: Can a company profit from developing a gene therapy to treat a rare disorder? If not, who will develop and pay for these life-saving treatments?



Genetics for Solving Crimes

DNA Can be used to identify criminals with incredible accuracy when biological evidence exists. DNA can be used to clear suspects an exonerate persons mistakenly accused or convicted of crimes.

In all, DNA technology is increasingly vital to ensuring accuracy and fairness in the

criminal justice system. DNA is generally used to solve crimes in one of two ways.

In cases where a suspect is identified a sample of that persons DNA can be compared to evidence from the crime scene. The results of this comparision may help establish whether the suspect committed the crime.

In case where a suspect has not yet been identified biological evidence from the crime scene can be analysed and compared to offender profiles in DNA databases to help identify the person who committed the crime.

With gene identification of the hair and criminals can be traced .

Commercial viability of Gene Therapy

Many genetic disorders that can potentially be treated with gene therapy are extremely rare, some affecting just one person out of a million. Gene therapy could be life-saving for these patients, but the high cost of developing a treatment makes it an unappealing prospect for pharmaceutical companies.

Some diseases that can be treated with gene therapy, such as cancer, are much more common. However, many promising gene therapy approaches are individualized to each patient. For example, a patient's own cells may be taken out, modified with a therapeutic gene, and returned to the patient. This individualized approach may prove to be very effective, but it's also costly. It comes at a much higher price than drugs that can be manufactured in bulk, which can quickly recover the cost of their development.

Developing a new therapy—including taking it through the clinical trials necessary for government approval— is very expensive. With a limited number of patients to recover those expenses from, developers may never earn money from treating such rare genetic disorders. And some patients may never be able to afford them.

Intas' s CENTRE OF CELL & GENE THERAPY

Ahmedabad based Pharmaceutical company Intas first company in India have setup a R&D division specially meant for Gene Therapy with a vision to develop the next generation gene- and cell-based therapeutics to treat blood-related disorders, blindness, muscular dystrophies and different cancers.

Startup of the Month

Spark Therapeutics Country: USA | Funding: $763.8M

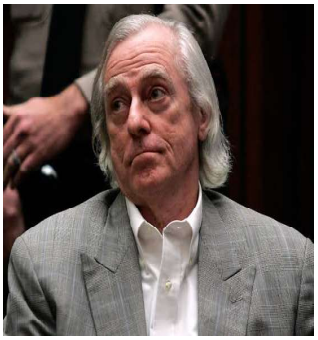
Spark is a leader in the field of gene therapy, seeking to transform the lives of patients by developing potential one-time, life-altering treatments for debilitating genetic diseases. We initially are applying our integrated platform to treat rare diseases where no, or only palliative, therapies exist.

At Spark Therapeutics,they are using adeno-associated viral (AAV) vectors to advance research programs against strategically selected cell targets, for example, the retina, liver and central nervous system

Founded in March 2013 as a result of the technology and know-how accumulated over two decades at Children's Hospital of Philadelphia (CHOP), our investigational therapies have the potential to provide long-lasting effects, dramatically and positively changing the lives of patients with conditions where no, or only palliative, therapies exist. Greater understanding of the human genome and genetic abnormalities have allowed our scientists to tailor investigational therapies to patients suffering from very specific genetic diseases.

Who is the godfather of gene therapy?

French Anderson, MD, was "dubbed 'the father of gene therapy' after a team he led in 1990 cured a hereditary disease of the immune system in a 4-year-old girl.



SAT - Scholastic Aptitude Test

1.The G.C.D of two numbers is 37. The two factors of their L.C.M are 7 and 8. What is the smallest of the two numbers.

a.37 b.259

c.296 d.148

The numbers are (37 x 7) = 259 and (37 x 8) = 296.

37 is the common factor

Number = common factor x Multiples of their L.C.M

So the biggest number is 296 and smallest number is 259.

So the answer is (b)

2. The number of fishes in an aquarium can be equally divided into 14, 16and 18 tanks such that each tank carries equal number of fishes. What is the minimum number of fishes in the aquarium?

a. 504 b.1008

c.2016 d.2520

The minimum number of fishes in the aquarium can be found by finding the L.C.M

2	14, 16, 18
7	7, 8, 9
8	1, 8, 9
9	1, 1, 9
	1, 1, 1

L.C.M

= 2 x 7 x8 x 9 = 1008

So the minimum number of fishes in the aquarium is 1008

The answer is (b)

3.The population of a city increases by 5% in the first year and 10% in the second year. If the current population is 41,000, What will be the population in 2 years.

a. 47,150 b. 47,355

c. 48,000 d.46, 835

$$41{,}000 \times \frac{5}{100} = 2050$$

$\Rightarrow$ 41,000 + 2050 = 43050

$$43050 \times \frac{10}{100} = 4305$$

$\Rightarrow$ 43050 +4305= 47355

In 2 years, the population is 47355

So the answer is (b)

4. Two dealers A & B sell mobiles at the same price. The first dealer allows two successive discounts of 28% and 15% and the second gives 18% and 24%. Which dealer gives more discount to the customer

a. A b. B c. A & B

Successive discounts = $\left[m+n-\frac{mn}{100}\right]\%$

$$\left[28+15-\frac{28\times15}{100}\right] = 28+15-4.2 = 38.8\%$$

$$\left[18+24-\frac{(18\times 24)}{100}\right]=42-4.32=37.68\%$$

First dealer gives more discount than second one.

So the answer is (a)

5. Bijay's savings of Rs.15,625 becomes Rs.27,000 in 3 years at a certain interest that is compounded annually what is the interest rate?

a.20% b.18% c.16% d.14%

$$27000=15625[1+\frac{R}{100}]^3$$

$$\frac{27,000}{15,625}=\left[1+\frac{R}{100}\right]^3$$

By taking cube root of both sides, we get R = 20%

So the answer is (a)

6. $\frac{3}{5}$ of the men and $\frac{1}{2}$ of women in a group speak English. If there are 40% women as many men in the group, what portion of the group do not speak English?

a. $\frac{3}{7}$ b. $\frac{4}{7}$

c. $\frac{5}{7}$ d. $\frac{6}{7}$

Since there is no solid numbers,

-let us plug in our own values.

Men = 100 , Women = $\frac{40}{100}\times 100=40$

Group = Men + Women

= 100 + 40 = 140

$\frac{3}{5}$ of men speak English

= $\frac{3}{5}\times 100=60$

$\frac{1}{2}$ of women speak English

= $\frac{1}{2}\times 40=20$

English speakers = 60 + 20 = 80,

Non- English speakers = 140 – 80 = 60

Fraction of non English speakers

$=\frac{60}{140}=\frac{6}{14}=\frac{3}{7}$

The fraction of Non English speakers

= $\frac{60}{140}=\frac{6}{14}=\frac{3}{7}$

So the answer is (a)

7. 4 Kids can finish a piece of work in 180 days, 9 men can complete the same work in 36 days. How many days will it take for 6 kids and 3 men to complete the work?

a. 56.8 days b. 80.3 days

c. 108 days d. 144 days

Work done by 1 kid = $\frac{1}{4\times 180}=\frac{1}{720}$

Work done by 1 man = $\frac{1}{9\times 36}=\frac{1}{324}$

Time taken by 6 kids and 3 men

$$= \left[6 \times \frac{1}{720}\right] + \left[3 \times \frac{1}{324}\right] = \frac{1}{120} + \frac{1}{108}$$

$$\frac{108+120}{12960} = \frac{228}{12960} = \frac{12960}{228} = 56.84 days$$

They can finish the work in 56.8 days.

So the answer is (a)

8. **Karthik can walk 12 kilometre in 1 hr. How many metres can he walk in 1 sec?**

a.3.3 m/sec b. 5m/sec

c. 6.2 m/sec d.9m/sec

Converting kilometre/hr to metre/sec

$$\Rightarrow 12 \times \frac{5}{18} = \frac{10}{3} = 3.3 m/\sec$$

So the ans is (a)

9. Two pipes A and B can fill a pipe in 24 mins and 48 mins respectively, while a third pipe can empty it in 60 mins. In what time will the tank be full if all the pipes are opened together?

a. 21.8 mins b. 36 mins

c.12 mins d.18 mins

$$x = 24, y = 48, z = 60$$

$$\left[\frac{xyz}{xy+yz+zx}\right] =$$

$$\frac{1}{x} + \frac{1}{y} - \frac{1}{z} = \frac{1}{24} + \frac{1}{48} - \frac{1}{60}$$

$$\frac{(48 \times 60) + (24 \times 60) - (24 \times 48)}{24 \times 48 \times 60}$$

$$= \frac{-69{,}120}{-3168} = 21.8 \min s$$

The tank will be full in 21.8 mins if all the pipes are opened together.

So the opiton is (a)

10. The ratio of cars to bikes in a parking lot is 3 : 4. If the number of cars is 39, find the total number of vehicles in the parking lot

a. 39 b.52

c.91 d.84

Cars : Bikes : : 39 : x

3:4 = 39 : x $\quad \frac{3}{4} = \frac{39}{x} \Rightarrow x = 52$

Total no.of vehicles = 39 + 52 = 91

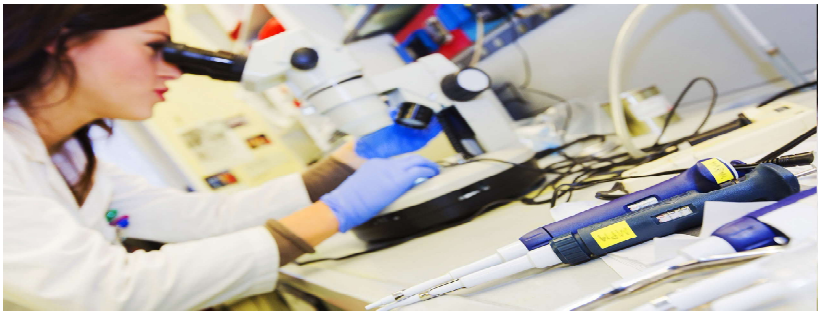
So the answer is (c)

A clone is a group of genetically identical cells or organisms derived from a single cell or individual.

Research Institution of the Month

The International Center for Genetic Engineering and Biotechnology

The ICGEB is a unique, autonomous, Intergovernmental Organisation, with biotech labs in Italy, India, and South Africa.



ICGEN is dedicated to advanced research and training in molecular biology and biotechnology and advancing knowledge, applying the latest techniques in the fields of Biomedicine

Crop improvement Environmental protection/Remediation Biopharmaceuticals, Biopesticide and Biofuel Production.

The ICGEB is governed by the Board of Governors, made up of representatives from each Member State and the Council of Scientific Advisers, composed of eminent scientists who oversee the scientific excellence of the Centre.

At present 700 people, from over 40 different countries, work at the ICGEB, of which almost 600 are scientific personnel, including research scientists, postdoctoral fellows, PhD students, research technicians.

In the year 1983 – The International Centre for Genetic Engineering and Biotechnology is launched with the signing of its Statutes (the international treaty sanctioning its existence, Deposited with the Secretary General of the United Nations) by 26 countries during a Plenipotentiary Meeting, held in Madrid.

Today, the ICGEB counts well over 65 Member States, and burgeoning Regional Research Centres across the globe.

Should you really have chyawanprash in winters?

Arun Bharathi

Winter brings with it a series of drastic weather changes, which influence your daily life considerably. At this time of the year, your body needs more warmth, coupled with energy giving food and stronger immunity to remain healthy.

How can chyawanprash keep you warmer and stronger in winter?

Chyawanprash is an Ayurvedic preparation with a jam like texture containing a variety of herbs that has a number of health benefits.

Chyawanprash affects your health positively in a number of ways, especially during winters. Read on to find out how the Ayurvedic product can be wonderful for your overall health and well-being during the cold winter days.

1. Boosts your immune system

When the weather begins to change and signals the onset of winter, the risk of fungal, viral and bacterial infections increase. During this time, consumption of chyawanprash strengthens your immunity and protects your from these conditions. The amla or Indian gooseberry content of the Ayurvedic preparation is enriched with vitamin C, and is acts as an immunity booster.

2. Keeps indigestion at bay

Your appetite naturally increases during the winters which often results in digestion problems.

Chyawanprash helps your body to efficiently absorb the nutrients from the food you eat and aids in keeping the amount of stomach acids balanced. This in turn relieves you from conditions like constipation, nausea, flatulence, and diarrhea.

3. Restores the moisture balance of your skin

Winter robs away the moisture from your skin and makes it dry and damaged. Chyawanprash is a preferred remedy for winters due to its photo-nutrient and vitamin C content. This imparts your skin with a healthy glow and enhances your complexion by maintaining the correct moisture level.

Why you shouldn't have chyawanprash in summers?

Ideally, chyawanprash can be consumed all year round but in India, summers tend to get very hot and therefore it may not be a good idea due to following reasons:

1. Owing to the warm nature of chyawanprash it may generate excessive heat in your body and is thus best avoided during the summer

2. The warmth generated by chyawanprash in your body may result in rashes on the skin if consumed during the hot summer months

3. Intake of chyawanprash during summer may trigger pimples due to its property of trying to stabilize your hormonal imbalances

Genes are made of DNA. DNA is a long, long chemical chain that is twisted so it looks like a spiral staircase. The millions of steps on the staircase make up the genetic code.

Every Day Science

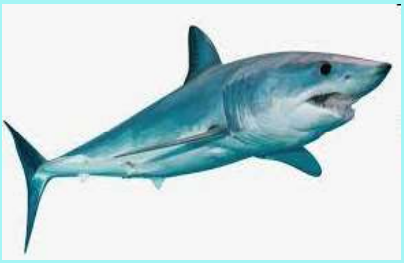
1. How many bones do sharks have in their bodies

a. 0

b. 250

c. 56

d. 76



2. Which metal is present in the human body in greater percentage

a. Sodium

b. Calcium

c.Potassium

d. Iron

3. Which one of the forest that never burns

a. Coniferous forest

b. Tropical rain forest

c.Tundra forest

d. Deciduous forest

4.To provide better grip to vehicles on the road friction should be

a.Large

b. Small

c.Extremely large

d. None of these

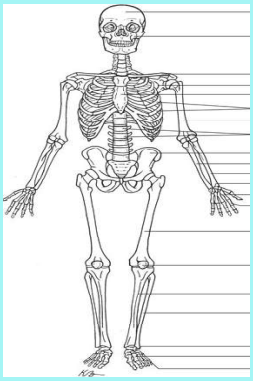
5. Which muscle type is moved voluntarily

a. Cardiac

b. Smooth

c. Skeletal

d. All of the above



6. The accumulation of lead in human body leads to

a. Weakening of bones

b.Weakening of nerves

c.Paralysis

d. Mesothelioma

7.Which one is used in a refrigerator for cooling purposes

Every Day Science

a. Sodium

b. Freon

c. Radon

d. Fluorine

8.Which animal has the heaviest heart

a. Sheep

b. Cow

c. Horse

d. Dog

9. Which of the following is not an element of the bone

a. Carbon

b. Calcium

c. Oxygen

d. Phosphorus

10. Cocoa tree is the source of natural chocolate flavour. Which part of the tree is the source

a. Stem

b. Leaves

c.Flower

d. Seeds

Answers - Every Day Science

1 – a, 2 – b, 3 – b, 4 – a, 5 – c , 6 – b, 7 – b, 8 – c, 9 – a, 10 – d

Do You Know? Diadromous Fish

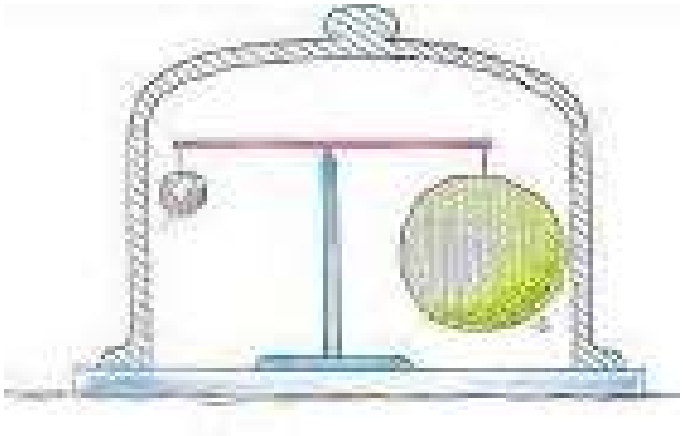
Diadromous fish are fish that migrate between freshwater and saltwater. Only one percent of all fish in the world are diadromous. Some diadromous fish migatre great distances, while others migrate much shorter distances. In either case, these fish undergo physiological changes that allow them to survive as they migrate from freshwaterto saltwater or vice versa. There are three main types of diadromy. They are Anadromous Fish,Catadromous Fish,Potamodromous Fish. Some examples of Diadromous fish are Salmon,Eels,

Thinking Physics

In the presence of air, the small iron ball and large plastic ball balance each other. When air is evacuated from the container the large ball

a. Rises **b. Falls** **c. Remains in Place**

(b) Falls .



Before evacuation, the forces acting on each ball are the gravitational force, the force exerted by the balance beam and the upward buoyant force exerted by the surrounding air. Evacuating the container removes the buoyant force on each ball.

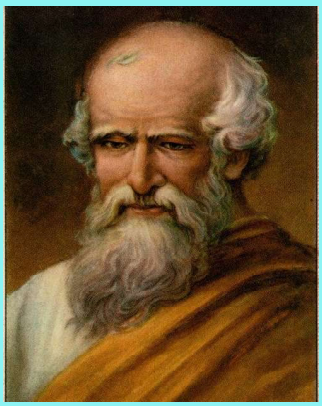
Since buoyant force equals the weight of air displaced, and the larger ball displaces the greater weight of air, the loss of buoyant force is greater for the larger ball, which falls.

In the presence of air, a larger object with its greater buoyant force must have a slightly greater weight to balance a smaller object with its correspondingly smaller buoyant force.

Thinking Physics

Objects with a density less than that of the fluid will float because the buoyant force is greater than the gravitational force acting on the object. Conversely, objects denser than the fluid will sink since the buoyant force is insufficient to support the object against gravity.

This principle is formulated by the Ancient Greek Scientist **Archimedes**



Understanding buoyancy is essential in various fields in everyday applications, such as ship design, swimming, and the behavior of objects in liquids.

Buoyancy is the force exerted by a fluid (liquid or gas) that opposes the weight of an immersed or submerged object. This force is directed upward, counteracting the force of gravity pulling the object downward. Buoyancy is a crucial factor in understanding why objects float or sink in fluids.

Why? What? How?

Albatrosses don't move their wings when they fly. Why?

Albatrosses spend most of their lives in the air. They have narrow, straight and very long wings that are perfectly adapted to their way of life. Albatrosses use this technique by flying low over the water, where the wind is slowed down by the surface drag.They don't even need thermal up - currents to soar, since the ordinary movements of air above the surface of the sea are sufficient for them. The wandering albatross , with a wingspan of up to 3.4 m is the largest of the albatrosses and it can glide through the skies for days, covering vast distances without once flapping its wings. In fact, it has to be able to do that because flapping its long wings would rapidly bring it to the limit of its physical strength. A single wing beat uses up more of the bird's enenrgy reserves than many hours of almost effortless gliding.

It can cover almost 1,000km (620 miles) every day, all without a single wing-flap

They Can Smell Food In the Water From 12 Miles Away

They Can Go Years Without Touching Land

Why? What? How?

Why is the water in a well cold in summers and warm in winters?

Earth is a bad conductor of heat. That is why the heat from the atmosphere is unable to pass through the earth and heat the water in the well keeping it cool.

Similarly in winters the heat from the well is unable to escape out from the earth, keeping the water in the well warm.

Deeper wells are often insulated from surface temperature fluctuations. If a well is deep, the water may be cooler in the summer and warmer in the winter because it takes longer for temperature changes to reach deeper levels

The temperature of the ground surrounding the well can affect the water temperature. In many regions, the ground temperature remains relatively stable throughout the year at depths where wells are typically drilled.

The geothermal gradient may cause the water in a well to be warmer than the surface temperature in winter and cooler in summer.If the well is located in an area with extreme seasonal temperature variations, it may influence the water temperature.

However, this is not a universal rule, and local geological and hydrological conditions play a significant role.

The Marvelous Science Behind Elephant Teeth

Introduction:

Elephants, the gentle giants of the animal kingdom, possess a fascinating set of teeth that play a crucial role in their survival and well-being. These incredible creatures have a distinct dental structure that reflects their unique lifestyle and dietary habits. In this article, we will delve into the science behind elephant teeth, exploring their composition, function, and the remarkable ways in which they contribute to an elephant's life.

Dental Composition:

Elephants are known for their massive size, and their teeth are no exception. Unlike humans, elephants have only four teeth, all of which are molars. These molars are large, flat, and carry a complex structure designed for the specific challenges of an herbivorous diet.

Elephant teeth are composed of dentin, enamel, and cementum. The dentin forms the bulk of the tooth, providing strength and support. Enamel, the hardest substance in the human body, covers the crown of the tooth, protecting it from wear and tear. Cementum, a calcified tissue, surrounds the roots and helps anchor the tooth in the jaw.

Continuous Tooth Replacement:

One of the most intriguing aspects of elephant teeth is their continuous replacement throughout the animal's life. Elephants are polyphyodonts, meaning they go through multiple sets of teeth. As their teeth wear down from the grinding of tough plant material, new teeth slowly move forward to take their place. This process typically occurs six times during an elephant's lifetime, with the last set being the sixth and final set of molars.

Chewing Mechanism:

Elephants are herbivores, primarily consuming a diet of grasses, leaves, bark, and other plant materials. To efficiently process this fibrous vegetation, their molars have a unique grinding mechanism. The molars have a series of ridges and valleys, forming a complex pattern that aids in breaking down tough plant fibers. As the jaw moves in a circular motion, these intricate dental features work together to grind the food into smaller, more manageable pieces for digestion.

Dental Adaptations for Herbivory:

Elephant teeth are a testament to the evolutionary adaptations that allow these majestic animals to thrive on a plant-based diet. The large size of their molars provides a large surface area for effective grinding, while the continuous replacement ensures a steady supply of functional teeth throughout their lives. This adaptation is crucial for their survival, as it allows them to extract maximum nutrition from the often tough and abrasive plant materials they consume.

Conclusion:

In conclusion, the science behind elephant teeth reveals a remarkable adaptation to their herbivorous lifestyle. From their unique dental composition to the continuous replacement of teeth, every aspect is finely tuned to support the dietary needs of these incredible creatures. Studying the teeth of elephants not only provides insights into their biology but also highlights the intricate ways in which animals have evolved to thrive in their respective environments. The next time marvel at an elephant's grandeur, take a moment to appreciate the science hidden within their magnificent set of teeth.

Know the unknown facts about elephants

1. African elephants have the best sense of smell in the animal kingdom
2. Elephants are scared of bees.
3. Elephants are the only mammals beside humans to have chins
4. Elephants normally sleep only 2 to 3 hours
5. An adult elephant requires up to 300 kg of food and 160 litres of water per day
6. An elephants pair of tusks may exceed 200 kg.
7. Elephants are pregant for 2 years
8. An elephant can smell water from 12 miles away
9. Elephants can detect rain 150 miles away

10. Elephants brain can weigh as much as 5 Kilo more than the brain of any other animal.

11. Elephants have 3 times the number of neurons that humans have
12. An adult asian elephant is capapble of holding 8.5 Litre of water in its trunk

13. An elephant's trunk has more than 40,000 muscles

14. **Elephants don't like peanuts**

15. They Can Hear Through Their Feet

Olympiad Problems for Junior Level students

MATHS

(For Students class (VI to IX)

1. In a certain class there are 12 boys and 18 girls. If the class average for an algebra exam is 90 and the boy's average score is 87, what is the girls' average score?

a. 88.5 b. 91

c. 92 d. 93

The class average is equal to the number of boys times the boy's average plus the number of girls times the girls's average divided by the total number of students

Let x = The girls average

$$\frac{12(87)+18(x)}{30}=90$$

Cross multiplying

$$12(87)+18(x)=30(90)$$

= 1044 + 18 x = 2700

18 x = 2700 – 1044

18 x = 1656

x = 92

So the girls' average score is 92. So the option is (c)

2. A subway train passes 3 stations every 10 minutes. At this rate, how many stations will it pass in one hour?

a. 4 b. 18

c. 22 d. 26 e. 35

Since there are 60 minutes in an hour, the subway will pass $\frac{60}{10}$ or 6 times as many stations in 1 hour as it passes in 10 minutes.

In 10 minutes it passes 3 stations.

In 60 minutes, it must pass $\frac{60\times3}{10}=18$ stations.

So the option is (b) i.e 18

3. Four people shared a taxi to the airport. The fare was Rs.40 and they gave the driver a tip equal to 25% of the fare.If they equally shared the cost of the fare and tip, how much did each person pay?

a. 12.50 b. Rs. 15

c. 20 d. 25 e. 30

The total cost of the taxi ride equals

Rs.40 + 25% of 40

$$40+\frac{1}{4}\times40=40+10=50$$

If four people split the cost equally, then each person paid $\frac{50}{4}=12.50$

So the correct answer is (a) i.e 12.50

4. Father is 5 years older than mother and mother's age is now thrice the son's age.If the son is 10 years old now, what was the father's age when the son was born?

Present age of the Son = 10 yeras

Present age of Mother = 10 x 3 = 30 years

Present age of Father = 30 + 5 = 35 years

Age of the father when the son was born

= 35 – 10 = 25 years.

5.The sum of two numbers is 45 and their ratio is 7 : 8. The numbers are

a. 28 : 32 b. 35 : 40

c. 21 : 24 d. None

Let first number be x

Second number = 45 – x

$$\therefore \frac{x}{45-x}=\frac{7}{8}$$

$$8x=7(45-x)$$

$$8x=315-7x$$

$$8x+7x=315$$

$$15x=315$$

$$x=21$$

Second number = 45 – 21 = 24

Verification

The sum of two numbers = 21 + 24 = 45

6.The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions to move once over to level the playground.

Find the area of the playground.

Diameter of the cyclindrical roller = 84 cm

$\therefore$ Radius = $\frac{1}{2}\times 84=42cm=0.42m$

Length of the roller (h) = 120 cm = 1.2 m

Area covered by the roller in one revolution

Curved surface area of the roller

= $2\pi rh$

= $\left[2\times\frac{22}{7}\times 0.42\times 1.2\right]m^2=3.168m^2$

Area covered by the roller in 500 revolutions

= 3.168 x 500 = 1584 m^2

7.A sum amounts to Rs.1210 at the rate of 10% per annum compound interest for two years, then the sum is

a. Rs.100 b. Rs.1100

c. Rs.1000 d. Rs.1200

P rincipal = ?

Amount = Rs.1210

Number of years = 2

Rate of interest = 10%

So Principal

$$\therefore 1210 = p\left(1+\frac{10}{100}\right)^2$$

$$= p\times\left(\frac{11}{10}\right)^2$$

$$= p\times\frac{121}{100}$$

$$p = \frac{100}{121}\times 1210 = Rs.1000$$

So the principal amount is Rs.1000.

So the option is (c)

8. A boy wants to distribute 25 apples between his two friends Ram and Shyam in such a way that Ram gets 5 apples more than what shyam gets. How many apples will each get?

Total number of apples = 25

Ram gets five apples more than what shyam gets

Remaining apples = 25 – 5 = 20

Dividing 20 apples equally among Ram and Shyam

Shyam gets = $\frac{20}{2} = 10 apples$

Ram gets = 10 + 5 = 15 apples.

So, Ram gets 15 apples and Shyam gets 10 apples.

9.A man completes $\frac{4}{30}$ of his journey by aeroplane, $\frac{12}{30}$ by train and the rest by taxi.Find what part of his journey he completes by taxi.

Journey completed by aeroplanes and train = $\frac{12}{30}+\frac{4}{30}=\frac{16}{30}$

Journey completed by taxi = $1-\frac{8}{15}=\frac{7}{15}$

He completed $\frac{7}{15}$ of his journey by taxi.

10. A water tanker contained 360 litres of water Out of which 90 litres leaked out. Find out What percent of the water in the tanker was due to leakage?

Out of 360 litres of water, water leaked = 90 litres

So water leaked out = $\frac{90}{360}$

Out of 100 litres of water = $\frac{90}{360}\times 100 = 25\%$

25% percent of the water in the tanker was due to leakage?

The vibrant colors we see in flowers and fruits are a result of plant genetics.

Basic Physics

(For NTSE/ IIT/ NEET / Olympiad competitive Examination)

Sound

Any periodic disturbance produced in a material medium due to the vubratory motion of the particles of the medium constitutes a **wave.**

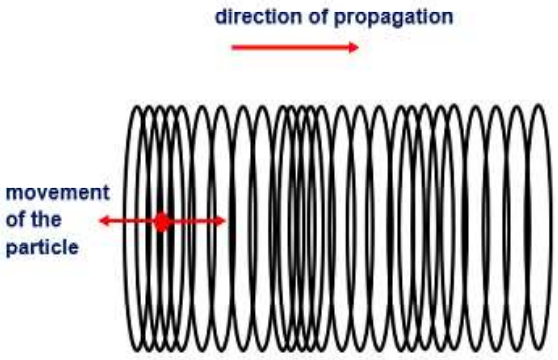
Pulse

A disturbance which is sudden and lasts for a short durartion of time is called pulse.

The waves which require a material medium for their propagation are called **mechanical waves.** They are also known as **elastic waves.Sound waves are mechanical waves but** ligth waves are electromagnetic waves and do not need any medium for their propagation. Thus light waves can pass through vacuum but sound waves cannot pass through vacuum.

The wave in which the particles of the medium oscillate along the direction of propagation of the wave is called a longitudinal wave. Such a wave travels in the form of compressions and rarefactions.

Sound waves are **longitudinal wave.**Sound waves through air are longitudinal waves.



Sound waves through air are longitudinal waves.

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The wave in which the particles of the medium oscillate in a direction perpendicular to the direction of the propagation of the wave is called a **transverse wave**.Such a wave

travels in the form of crests and troughs. Light waves are transverse waves

The part or region of a longitudinal wave in which the density of the particles of the medium is higher than the normal density is known as **compression.**

The part or region of a longitudinal wave in which the density of the particles of th emedium is lesser than the normal density is called a **rarefaction.**

The point of maximum positive displacement on a transverse wave is known as **crest**

The point of maximum negative displacement on a transverse wave is known as **trough**

A wave of short duration which is confined to a small portion of a medium at any given time is known as a **pulse.**

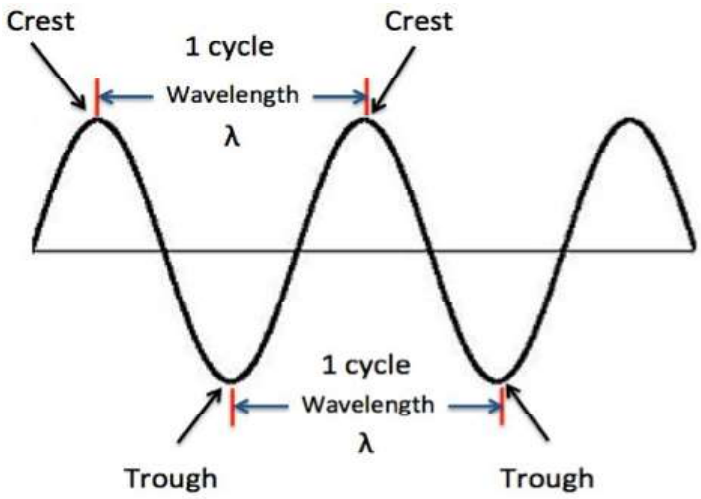
The distance between two adjacent crests or two adjacent troughs of a wave is called its wavelength. It is denoted by λ

The number of waves produced per second is called its **frequency.**

The maximum displacement of particles of the medium from their mean positions during the propagation of a wave is known as **amplitude of the wave.**

Wavelength

The distance after which the pattern of wave motion repeats itself is called the wavelength of the wave. It is denoted by λ. It may also be defined as the distance between two



Crest, Trough and Wavelength

conseecutive crests or two consecutive troughs (in case of trasverse wave) or two consecutive compressions or two consecutive rarefactions (in case of longitudinal wave)

Time period of a wave

The time taken by a wave to travel a distance λ in the medium is called its time period

Frequency of a wave

The number of oscillations made per

second by the vibrating particle of the medium during the course of wave propagation is called frequency (f or v)

$$\therefore \qquad f = \frac{1}{T}$$

Velocity of a wave

The velocity V with which a wave propagates through a medium is given by the relation

$$v = f\lambda$$

Audible range

Human ears can only hear sounds with frequencies between about 20 hertzs and 20000 hertzs.Sound waves of frequency below 20 Hz are called infrasonics and the sound waves of frequency higher than 20,000 Hz are called uitrasonics. The range of human hearing is from 20 Hz to 20,000 Hz.

Supersonic velocities

The velocities greater than the velocity of sound are called supersonic velocities.

Echo

An echo is a reflection of sound . Depth of a sea can be found by an echo. An echo is produced by the reflection of sound by a smooth and hard surface.

Speed of sound

The speed of sound is much less than the speed of light.Sound travels in dry air at a speed of about $340 ms^{-1}$ but the speed of light is $3 \times 10^8 ms^{-1}$

Reverberation

Reverberation is the continuous occurence of echoes.

Sonar

SONAR stands for sound navigation and ranging . It is used to detect underwater objects by reflected, or emitted sound.

Audible sounds

All sounds that we can hear through our ears are known as audible sounds. If its loudness is equal to or more than the threshold of hearing and its frequency lies between 20 Hz and 20,000 Hz.

Inaudible sounds

All sounds that we fail to hear through our ears are known as inaudible sounds.If its loudness is less than the threshold of hearing and its frequency is less than 20 Hz or more than 20,000 Hz.

Multiple Choice Question - SOUND

1. Which of the following is a mechanical wave

a. Radio waves

b. Light waves

c.Sound waves

d. Micro waves

2. A body produces sound only if it is

a. Made of glass

b. Made of steel

c. Made of Iron

d. Vibrating

3. Waves produced in a gas are

a. Transverse

b. Partly transverse, partly longitudinal

c. Longitudinal

4. A pulse is a wave

a. Of short duartion

b. Of high duartion

c. Which travels in vacuum only

5. SI unit of time period is

a. Second b. Hour

c. Minute d. Nanosecond

6.Which of the following is carried by the waves from one place to another

a. Mass b. Velocity

c. Wavelength d. Energy

7. Sound cannot travel through

a. Solids b. Liquids

c. Gases d. Vacuum

8. The loudness of a sound depends on its

a. Frequency b. TIme period

c. Amplitude d. All of these

9.Noise is measured in

a. Watt

b. Decibel

c.Joule

d. Noise cannot be measured

10.Sound is produced by a body when it

a. Is heated b. Is cooled

c. Vibrates d. Is cut

11. Hertz is the unit of

a. Frequency b. Amplitude

c.Loudness d. Quality

12.The maximum intensity level of sound human ears can tolerate is

a. 20 db b. 60 db

c. 80 db d. 120 db

13. All humans can hear

a. Sonic vibrations

b.Infrasonic vibrations

c. Ultra sonic vibrations

d. None

14. Birds produce sound using

a. Wings

b. Syrinx

c. Vocal cord

d. Larynx

15.In which medium does sound travel fastest

a.Air

b. Water

c. Steel

d. Vacuum

16.Flute is which type of musical instrument

a. String type

b. Wind type

c. Percussion type

17.Bats detect the obstacles in their path by receiving the reflected

a.Infrasonic waves

b. Electro- magnetic waves

c. Radio waves

d. Ultrasonic waves

18.Which of the following is not a characteristic of a musical sound

a. Pitch

b. Wavelength

c. Quality

d. Loudness

19.The speed of sound in medium depends upon

a. Amplitude

b. Wavelength

c. Frequency

d. Properties of the medium

20.Unit of wavelength is

a. Newton

b. Dyne

c. Erg

d. Angstrom

21. Sound and light waves both

a. Have similar wavelength

b. Obey the laws of reflection

c. Travel as longitudinal waves

d. Travel through vacuum

22.The physical quantity which oscillates in most waves is

a. Energy

b. Mass

c. Amplitude

d.Wavelength

23. A crest is the point of

a. Zero displacement

b.Minimum displacement

c.Maximum displacement

24. A Pulse is a wave

a. Of high duration

b. Of short duration

c.which travels in vacuum only

d. Which travels in solids only.

25. Supersonic means

a. Frequencies less than 20 Hz

b. Frequencies much more than that of ultrasonics

c. Same as ultrasonic

d. Same as infrasonics

26. Velocity of sound is maximum in

a. Mercury

b. Water

c. Air

d. Iron

27. Sound travels some time to travel from one place to another. It will be maximum

a.During summer

b. During winter

c. At night

d. All the time same

28. Waves produced due to the earthquake are known as

a. Seismic waves

b. Shock waves

c. Infrasonic waves

29.Water waves are

a.Longitudinal

b. Transverse

c. Both longitudinal and transverse

d. Neither longitudinal nor transverse(

30.Echo is produced due to

a. Refraction of sound

b. Reflection of sound

c. Resonance

d. None of these

31. Musical instruments in which sound is produced by allowing a leather membrane to vibrate are known as

a. Wind b. Reed

c. Percussion d. Stringed

32. A sound of frequency nearly 30,000 Hz could have been produced by a

a. Young child b. Human male

c.Human female d. Bat

33.Velocity of sound is minimum in

a. Carbon dioxide

b. Hydrogen

c. Nitrogen

d. None of these

34. The depth of the troughs of a wave is known as

a. Frequency

b. Displacement

c.Amplitude

d. None of these

35.Sound wavesin air are

a. Longitudinal

b.Transverse

c.Partly longitudinal and partly transverse

d.Sometimes longitudinal and sometimes transverse.

36. Sound waves cannot pass through

a. A Solid - liquid mixture

b. A liquid - gas mixture

c. An ideal gas

d. A perfect vacuum

37. A body produces sound only if it is

a. Made of glass

b. Made of steel

c.Made of iron

d. Vibrating

38. The frequency of sound waves can be expressed in

a. Cycle

b. Second

c. Cycle per second

d. Metre per second.

39.Wave motion involves transfer of

a. Momentum only

b. Energy only

c. Both energy and momentum

d. Neither energy nor momentum

40.Out of the following media, the speed of sound is maximum in

a. Air b. Water

c. Iron d. Glass

Answers - MCQ (SOUND)

1– c 2 – d, 3 – c 4 – a, 5 – a, 6 – d, 7 – d, 8 – c, 9 – b, 10 – c

11 – a 12 – a 13 – a 14– b 15 – c 16 – b 17 – d 18 – b 19 – d, 20 – d

21 – b 22 – c 23 – c 24 –b 25 – c 26 – d 27 – b 28 – a 29 – d 30 – b

31 –c 32 – d 33 –a 34 – c 35 – a 36 – d 37 – d 38 – c 39 – c 40 – c

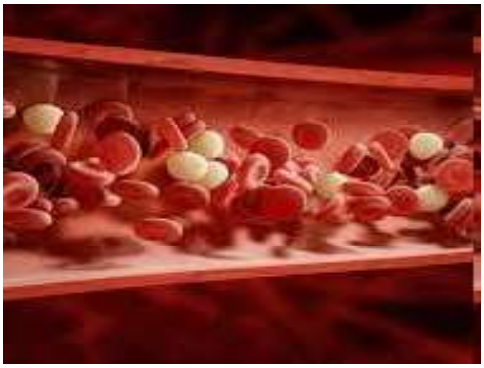
Do you Know ? Father of Indian DNA fingerprinting"

Lalji Singh FNA, FASc (1947 – 2017) was an Indian scientist who worked in the field of DNA fingerprinting technology in India, where he was popularly known as the ***"Father of Indian DNA fingerprinting".*** *He had made important contribution to the field of genetics, particularly related to human populations as well as wildlife conservation forensic.*

Blood - The Red Gold

Blood as a Transport System

Blood is a vital fluid that serves as a transportation system in the body, carrying oxygen and nutrients to cells while removing carbon dioxide and other waste products. It is pumped by the heart and circulates through the entire body, continuously repeating the process.

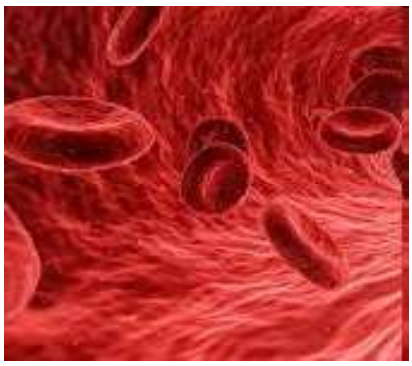


Blood as Tissue and Fluid

Blood is considered both a tissue and a fluid. It is a tissue because it comprises specialized cells with specific functions, suspended in a liquid matrix called plasma, making blood a fluid.

Blood Composition

The components of human blood include plasma, red blood cells (RBCs), and white blood cells (WBCs). Plasma is the liquid part of blood, consisting of water and various essential substances such as proteins, sugars, and fat particles. RBCs, which contain hemoglobin, transport oxygen from the lungs to the rest of the body. WBCs help fight infections and support the immune process.



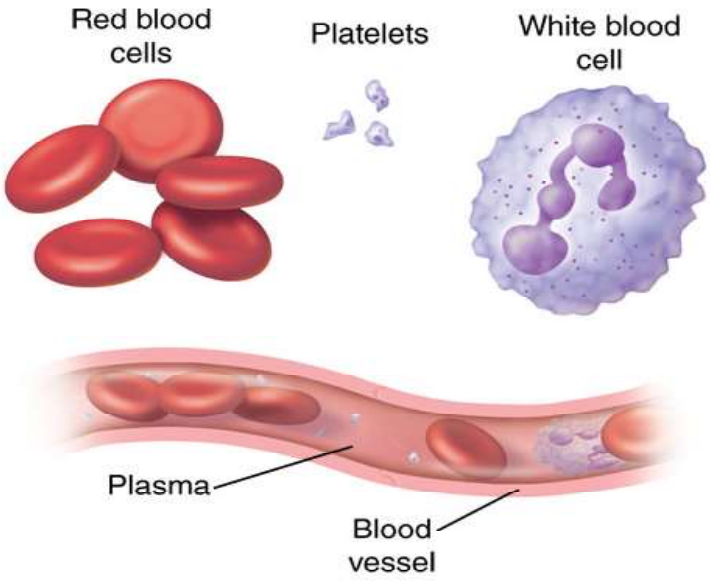
Quantities and Production

Blood makes up approximately 8% of the body weight, with an average adult possessing around 5-6 liters of blood. The components of blood, particularly red and white blood cells, are continuously produced and replaced. Red blood cells have a lifespan of about 120 days, and the production and destruction occur at a rate of 2-3 million cells per second.

Blood - The Red Gold

Blood Circulation

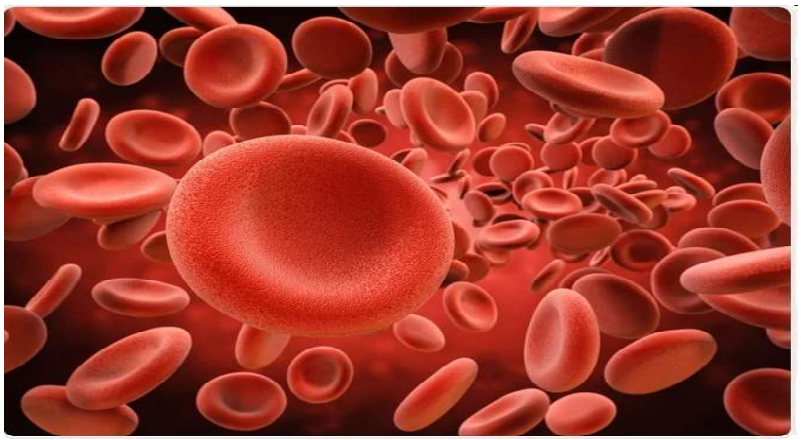
Blood circulates constantly, picking up nutrients from food, oxygen from the lungs, and delivering them to cells for energy. It also collects waste products, such as carbon dioxide, from cells and transports them to the lungs for exhalation.



"Red Gold"

Blood is sometimes referred to as "red gold" due to its value. The cells and proteins in blood can be valuable, and there are instances where they can be sold for more than the cost of the same weight in gold.

In summary, blood plays a crucial role in maintaining the body's functions by ensuring the delivery of essential substances and the removal of waste products. Its intricate composition and continuous circulation make it a vital component of human physiology.



Scientists use **genetic engineering** techniques to enhance plant traits and improve crop yield. These techniques involve introducing foreign genes or modifying existing genes to enhance desirable characteristics, such as resistance to pests or tolerance to drought.

Exploring the World of Viruses: Tiny Troublemakers That Teach Us Big Lessons

Viruses are fascinating, tiny, entities that play a big role in the world around us. We have probably heard about viruses in the context of illnesses, but there's so much more to these microscopic troublemakers than meets the eye.

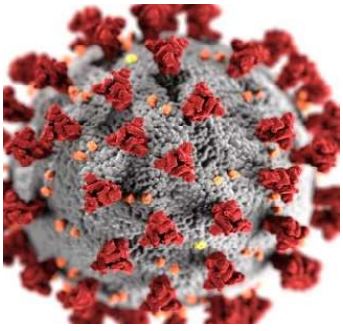
What Are Viruses?

Viruses are not quite alive in the traditional sense. Unlike bacteria, fungi, or plants, they lack the necessary cellular machinery to carry out basic life functions on their own. Instead, viruses are minuscule particles consisting of genetic material (either DNA or RNA) surrounded by a protective coat of proteins. Imagine them as tiny, invisible packets of information.

How Do Viruses Work?

Viruses are like master infiltrators; they need a host to carry out their activities. They can infect various forms of life, including animals, plants, and even bacteria. Once inside a host, a virus inserts its genetic material into the host's cells, hijacking the cellular machinery to replicate itself. This process often damages or destroys the host cell, causing the symptoms of illness that we associate with viral infections.

Different Types of Viruses



There is an incredible diversity of viruses, each with its own unique characteristics. Some cause familiar illnesses like the flu or the common cold, while others may lead to more severe diseases such as COVID-19, HIV/AIDS, or the flu. Viruses can also impact animals and plants, affecting ecosystems in complex ways.

Lessons from Viruses

Adaptability: Viruses are masters of adaptation. They can evolve rapidly, developing new strains that may challenge our immune systems. Understanding this adaptability is crucial for developing effective vaccines and treatments.

Interconnectedness of Life:

Viruses highlight the interconnectedness of all living things. They can move between species, emphasizing the importance of a One Health approach that considers the health of humans, animals, and the environment as interconnected.

Scientific Discovery:

Studying viruses has led to groundbreaking scientific discoveries. The fields of molecular biology and genetics have benefited immensely from research on viruses, providing insights into the fundamental processes of life.

Medical Advances:

Vaccines, which protect us from many viral diseases, are a testament to human ingenuity. Learning about viruses inspires researchers to develop new ways of preventing and treating infections, pushing the boundaries of medical science.

Fun Facts about Viruses

The word "virus" comes from the Latin word meaning "poison."

Viruses are so small that they can only be seen with a powerful electron microscope.

The largest known virus is about the size of a bacterium, challenging our traditional notions of what a virus is.

In conclusion, while viruses may cause some of the illnesses we encounter, they also serve as invaluable teachers, offering lessons in adaptability, interconnectedness, scientific discovery, and medical innovation. So, when we hear about viruses, remember that these tiny troublemakers have a lot to teach us about the incredible complexity of life on Earth.

Komodo Dragons

Giants of the Indonesian Islands

Introduction:

Komodo dragons, scientifically known as Varanus komodoensis, are truly magnificent creatures that capture the imagination of anyone fortunate enough to encounter them. These often referred to as the kings of the lizard world.

Body:

Size and Appearance:

Komodo dragons are the largest and heaviest reptiles on the planet, reaching lengths of up to 10 feet or more.They possess a distinctive appearance with a long tail, strong and agile neck, and a forked tongue, making them a sight to behold.

Strength and Adaptations:

Komodo dragons are powerful predators and among the strongest in the lizard species.

Equipped with massive claws, powerful legs, and razor-sharp teeth, these dragons can run fast in short bursts and are proficient swimmers.

Their 60 sharp teeth can be replaced if damaged, allowing them to go through multiple sets in their lifetime.

Venomous Bite:

One of the Komodo dragon's deadliest weapons is its venomous bite.

Their saliva contains 50 different strains of toxic bacteria, causing a deadly infection in their prey. This venom ensures a swift and efficient kill.

Feeding Habits:

Komodo dragons are carnivores, feeding on a variety of meats, including carrion (dead animals), small lizards, snakes, and birds.

The dragons can consume an astonishing 80% of their body weight in a single meal, and they often share their bounty with other dragons, following a hierarchical eating order.

Reproduction:

Female Komodo dragons lay their eggs in nests they dig themselves, and the nests are often placed in the abandoned mounds of megapodes (ground-nesting birds).The incubation period for the eggs is around 7 to 8 months.

In the wild, Komodo dragons typically live up to 30 years. .The dragons are most active during the day, with a preference for early mornings and late afternoons.They are known to be excellent climbers and can also dig burrows for shelter and nesting.

Habitat and Range:

These incredible creatures have been living in the same habitat for millions of years, primarily in tropical forests, savannas, and grasslands.

They are endemic to several Indonesian islands, and their range includes places like Komodo Island, Rinca, Flores, Gili Motang, and Padar.

Conclusion:

In conclusion, the Komodo dragon is a living marvel, captivating with its immense size, strength, and unique adaptations. Studying these incredible creatures not only provides a glimpse into the wonders of the animal kingdom but also highlights the importance of conservation efforts to ensure the survival of these iconic reptiles.

They Can Reproduce Asexually
They Sometimes Eat Their Own Young
They Can Eat 80% of Their Weight in One Sitting
They Can Take Down Enormous Prey
They Have Sharklike Teeth

Science Park

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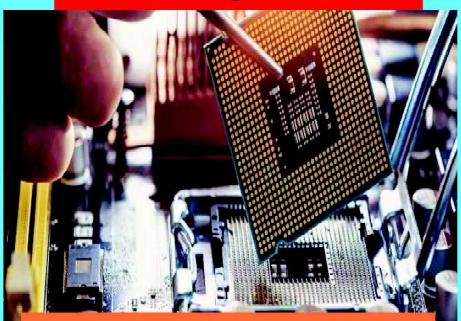

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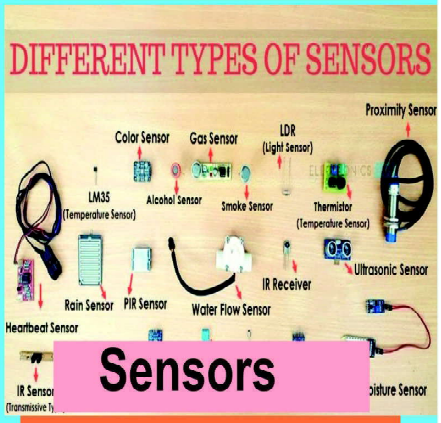

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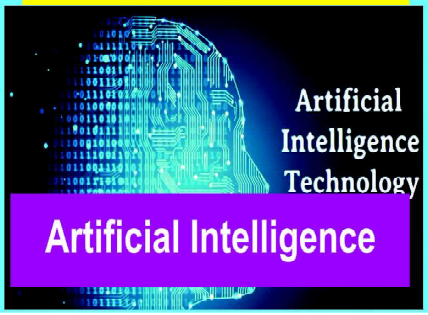

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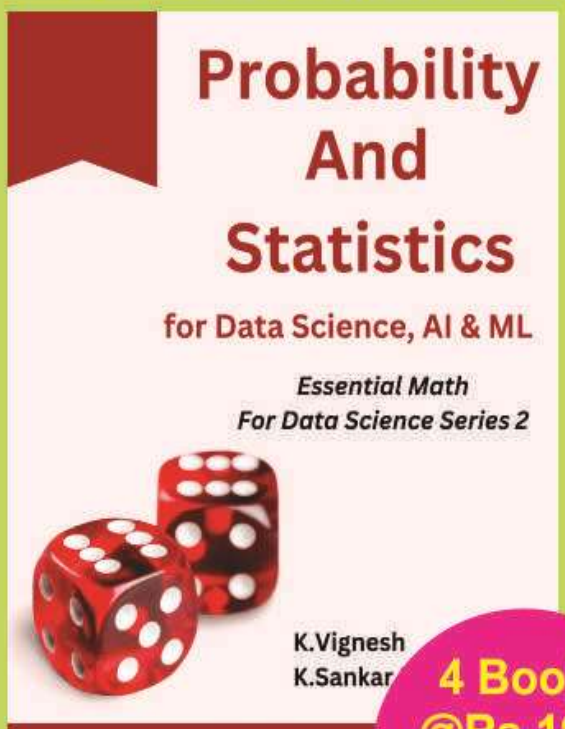

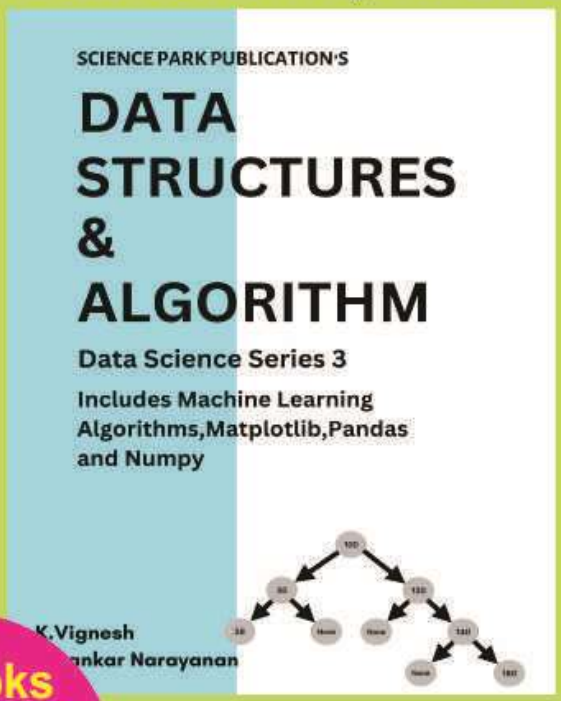

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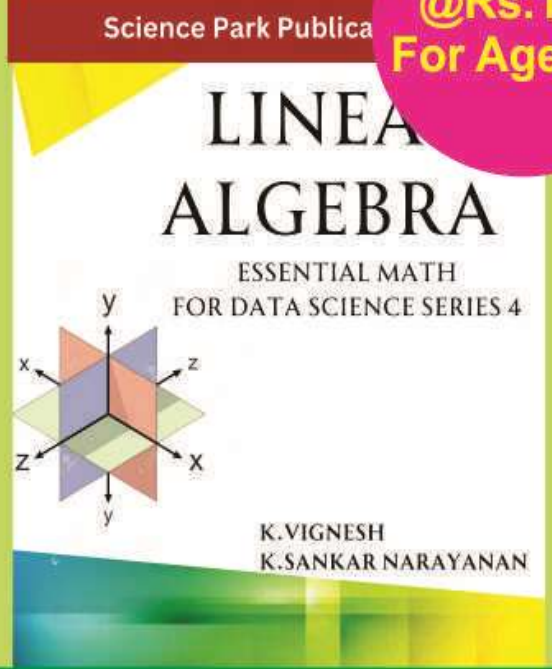

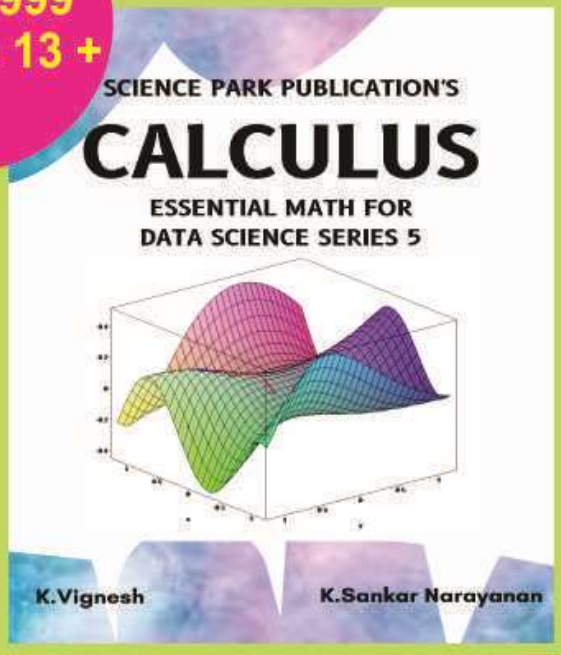

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