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General Knowledge – Part 21

BRANCHES OF BIOLOGY

Biology, the scientific study of life, includes several relevant branches. Below is a list of major branches of biology with a brief description for each.

Agriculture - science and practice of producing crops and livestock from the natural resources of the earth.

Anatomy - study of the animal form, particularly human body

Astrobiology - branch of biology concerned with the effects of outer space on living organisms and the search for extraterrestrial life.

Biochemistry - the study of the structure and function of cellular components, such as proteins, carbohydrates, lipids, nucleic acids, and other biomolecules, and of their functions and transformations during life processes

Bioclimatology - a science concerned with the influence of climates on organisms, for instance the effects of climate on the development and distribution of plants, animals, and humans

Bioengineering - or biological engineering, is a broad-based engineering discipline that deals with bio-molecular and molecular processes, product design, sustainability and analysis of biological systems.

Biogeography - a science that attempts to describe the changing distributions and geographic patterns of living and fossil species of plants and animals

Bioinformatics - information technology as applied to the life sciences, especially the technology used for the collection, storage, and retrieval of genomic data

Biomathematics - mathematical biology or biomathematics is an interdisciplinary field of academic study which aims at modelling natural, biological processes using mathematical

techniques and tools. It has both practical and theoretical applications in biological research.

Biophysics – or biological physics is an interdisciplinary science that applies the theories and methods of physical sciences to questions of biology

Biotechnology – applied science that is concerned with biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use

Botany – the scientific study of plants

Cell biology – the study of cells at the microscopic or at the molecular level. It includes studying the cells' physiological properties, structures, organelles, interactions with their environment, life cycle, division and apoptosis

Chronobiology – a science that studies time-related phenomena in living organisms

Conservation Biology – concerned with the studies and schemes of habitat preservation and species protection for the purpose of alleviating extinction crisis and conserving biodiversity

Cryobiology – the study of the effects of low temperatures on living organisms

Developmental Biology – the study of the processes by which an organism develops from a zygote to its full structure

Ecology – the scientific study of the relationships between plants, animals, and their environment

Ethnobiology – a study of the past and present human interactions with the environment, for instance the use of diverse flora and fauna by indigenous societies

Evolutionary Biology – a subfield concerned with the origin and descent of species, as well as their change over time, i.e. their evolution

Freshwater Biology – a science concerned with the life and ecosystems of freshwater habitats

Genetics – a science that deals with heredity, especially the mechanisms of hereditary transmission and the variation of inherited characteristics among similar or related organisms

Geobiology – a science that combines geology and biology to study the interactions of organisms with their environment

Immunobiology - a study of the structure and function of the immune system, innate and acquired immunity, the bodily distinction of self from nonself, and laboratory techniques involving the interaction of antigens with specific antibodies

Marine Biology - study of ocean plants and animals and their ecological relationships

Medicine - the science which relates to the prevention, cure, or alleviation of disease

Microbiology - the branch of biology that deals with microorganisms and their effects on other living organisms

Molecular Biology - the branch of biology that deals with the formation, structure, and function of macromolecules essential to life, such as nucleic acids and proteins, and especially with their role in cell replication and the transmission of genetic information

Mycology - the study of fungi

Neurobiology - the branch of biology that deals with the anatomy and physiology and pathology of the nervous system

Paleobiology - the study of the forms of life existing in prehistoric or geologic times, as represented by the fossils of plants, animals, and other organisms

Parasitology - the study of parasites and parasitism

Pathology - the study of the nature of disease and its causes, processes, development, and consequences

Pharmacology - the study of preparation and use of drugs and synthetic medicines

Physiology - the biological study of the functions of living organisms and their parts

Protistology - the study of protists

Psychobiology - the study of mental functioning and behavior in relation to other biological processes

Toxicology - the study of how natural or man-made poisons cause undesirable effects in living organisms

Virology - study of viruses

Zoology - The branch of biology that deals with animals and animal life, including the study of the structure, physiology, development, and classification of animals

Ethology - the study of animal behavior

Entomology - the scientific study of insects

Ichthyology - the study of fishes

Herpetology - the study of reptiles and amphibians

Ornithology - the study of birds

Mammalogy - the study of mammals

Primatology - the science that deals with primates

FAMOUS EXPLORATIONS

Achievement	Explorer (Year)	Nationality
Possible the first European landfall in North America	Ericson, Leif(1003)	Norse
Travels in Central Asia and China	Polo, Marci (1271-1295)	Italian
Voyage around the Cape of Good Hope	Dias, Bartholomew (1487)	Portuguese
Exploration of the Caribbean	Columbs, Christopher (1492-1504)	Italian
Landfall in Canada, with his Brother Sebastian	Cabot, John (1497)	Italian
First to sail around Africa to India	DaGama Vasco (1497-98)	Portuguese
First sea journey around the world	Magellan	Portuguese
Conquest and Exploration of Mexico	Cortes, Fernando (1519-1521)	Spanish
Conquest and Exploration of Peru	Pozarro Francisco (1530-1538)	Spanish
Discovery of Tasmania and New Zealand	Abel Janszoon (1642)	Dutch
Exploration of the South Pacific	Cook, James (1768-1779)	English
Exploration of Southern and Central Africa	Livingstone, David	Scottish
First north-south crossing of Australia	Burke, Robert O'Hana (1860-1861)	Irish
Exploration of Central Africa	Stanley, Henry Morton (1874-1889)	Welsh
First man to reach the North Pole	Peary, Robert E (1909)	American
First man to reach the South Pole	Amudsen Ruald (1911)	Norwegian
First man to orbit the Earth	Gagarian, Yuri (April 1961)	Russian
First man to step onto the Moon	Armstrong, Neil (July 1969)	American

FIRST IN SCIENCE AND TECHNOLOGY

First Hydroelectric Plant	On the Ganganachukki waterfall of the Sivasamudram Falls, Karnataka, built in 1902
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First City to have electricity	Banglore, in 1906 (it was in fact the first city to have electricity)
First Man in Space	Rakesh Sharma aboard Salyut 7, on April 03, 1984. He was the 138th man in space world-wide.
First Women in Space	Kalpana Chawla aboard Space Shuttle Columbia flight STS-87, on November 19, 1997 She was a naturalized United States citizen, and represented the US during the event.
First Test-tube baby	Durga Agarwal, born 1978
First Scientific Expedition to Antarctica	1981
First Nuclear Reactor	Tarapur, Maharashtra
First Genetically Modified Food Product in India	Bt. Egg Plant Hybrid
First Satellite	Aryabhata, launched on April 19, 1975
First Satellite dedicated exclusively for educational services	EDUSET
First Successfully Indigenous Launch Vehicle	SLV-3
The first person in the world to land on the moon	Neil A. Armstrong and Edwin E Aldrin Jr of USA (Armstrong was the first to set foot on the moon followed by Aldrin) - July 21, 1969
First man to enter space (or the world's first cosmonaut)	Yuri Gagarin (Russian)
The first returnable space shuttle	Colombia
The first disabled satellite repaired in space	Solar Max
The first unmanned moon-buggy to explore surface of the moon	Lunokhod-I (Russia)
The first unmanned spaceship to have	Luna - 16 (Russia) (Sept. 21, 1970)

soft-landed and lifted off from the moon to return to earth.

The first manned space vehicle to land on the moon Lunar Exploration Module (LEM) nick named "Eagle"

The first country to send men on the moon USA

The first to launch earth satellite or "artificial baby moon" Russia

The first woman cosmonaut of the world Valentina Tereshkova (Russian)

The first person to float in space Alexei Lenov (Russian)

The first American astronaut (and second person in the world) to float in space Edward White

The first country to launch a cosmic space rocket towards moon USSR

The first space rocket to hit the moon Lunik-II

The first spaceship in the world to sample moon's crust Surveyor-3 (USA)

The first space vehicle to soft-land on Moon Luna-9 (Russia)

The first space vehicle to orbite the moon Luna-10 (Russia)

The first space-craft to leave solar system Pioneer II

The first American manned spaceship to perform crew transfer in space Apollo-9 (USA)

The first manned spacehip to perform space flight round the moon Apollo-8 (USA)

IMPORTANT LINES AND BOUNDARIES

Durand Line is the line demarcating the boundaries of India and Afghanistan. It was drawn up in 1896 by Sir Mortimer Durand.

Hindenburg Line is the boundary dividing Germany and Poland. The Germans retreated to this line in 1917 during World War I.

Mason–Dixon Line is a line of demarcation between four states in the United States.

Marginal Line was the 320 km line of fortification on the Russia–Finland border. Drawn up by General Mannerheim.

Macmahon Line was drawn up by Sir Henry MacMahon, demarcating the frontier of India and China. China did not recognize the MacMahon line and crossed it in 1962.

Medicine Line is the border between Canada and the United States.

Order–Neisse Line is the border between Poland and Germany, running along the Oder and Neisse rivers, adopted at the Poland Conference (Aug 1945) after World War II.

Radcliffe Line was drawn up by Sir Cyril Radcliffe, demarcating the boundary between India and Pakistan. Siegfried Line is the line of fortification drawn up by Germany on its border with France.

17th Parallel defined the boundary between North Vietnam and South Vietnam before two were united.

24th Parallel is the line which Pakistan claims for demarcation between India and Pakistan. This, however, is not recognized by India.

26th Parallel south is a circle of latitude which crosses through Africa, Australia and South America.

30th Parallel north is a line of latitude that stands one-third of the way between the equator and the North Pole.

33rd Parallel north is a circle of latitude which cuts through the southern United States, parts of North Africa, parts of the Middle East, and China.

35th Parallel north forms the boundary between the State of North Carolina and the State of Georgia and the boundary between the State of Tennessee and the State of Georgia, the State of Alabama, and the State of Mississippi.

36th Parallel forms the southernmost boundary of the State of Missouri with the State of Arkansas.

36°30' Parallel north forms the boundary between the Tennessee and the Commonwealth of Kentucky between the Tennessee River and the Mississippi River, the boundary between Missouri and Arkansas west of the White River, and the northernmost boundary between the Texas and the Oklahoma.

37th Parallel north formed the southern boundary of the historic and extralegal Territory of Jefferson.

38th Parallel is the parallel of latitude which separates North Korea and South Korea.

39th Parallel north is an imaginary circle of latitude that is 39 degrees north of Earth's equatorial plane.

40th Parallel north formed the original northern boundary of the British Colony of Maryland.

41st Parallel north forms the northern boundary of the State of Colorado with Nebraska and Wyoming and the southern boundary of the State of Wyoming with Colorado and Utah.

42nd Parallel north forms most of the New York - Pennsylvania Border.

43rd Parallel north forms most of the boundary between the State of Nebraska and the State of South Dakota and also formed the northern border of the historic and extralegal Territory of Jefferson.

The Parallel 44° north is an imaginary circle of latitude that is 44 degrees north of the Earth's equatorial plane.

45th Parallel north is often the halfway point between the Equator and the North Pole. The 45th parallel makes up most of the boundary between Montana and Wyoming.

49th Parallel is the boundary between USA and Canada.

MOORTIDEVI AWARD

This Award carries the memory of **Moortidevi**, mother of **Late Sahu Shanti Prasad Jain**, founder of **Bharatiya Jnanpith**. This Award is presented for a contemplative or intellectual work, which underlines and expresses Indian philosophy and cultural heritage based on wider ideals and human values. It is conferred on the litterateur who is alive.

The Vice President of India Shri M. Hamid Ansari presented the "**26th Moorti Devi Award**" to **Shri Haraprasad Das**, one of the most influential contemporary poet and thinker in Odia Literature at a function organized by **Bharatiya Jnanpith** on 4th February 2014. The award consists of a Citation and a cash prize of Rs 4 Lakhs.

NAVLEKHAN AWARD

A writer's genius blossoms best in the natural climate of his mother tongue. The medium of language has, thus, a regional character. In effect, however, the production of a literary masterpiece becomes a national achievement and an international asset.

Although a writer because of an inner urge and a number of factors contribute to the creation of a literary masterpiece, social recognition and expression of national indebtedness reassure him that he is widely read, respected and loved. National awards and presentation of purses are tokens of such recognition.

In India, though there are a number of regional and national awards for best literary productions in Indian languages severally, there are hardly any awards for young authors writing in Hindi. It was to fulfill this objective that Navlekhan Award was instituted.

LIST OF BANKS

Bank	Founded In	Headquarter
Allahabad Bank	1865	Kolkata
Andhra Bank	1923	Hyderabad
Bank of Baroda	1908	Vadodara
Bank of India	1906	Mumbai
Canara Bank	1906	Bangalore
Central Bank of India	1911	Mumbai
Corporation Bank	1906	Mangalore
Dena Bank	1938	Mumbai
IDBI Bank Limited	1964	Mumbai
Indian Bank	1907	Chennai

Indian Overseas Bank	1937	Chennai
Oriental Bank of Commerce	1943	Gurgaon
Punjab & Sind Bank	1908	New Delhi
Punjab National Bank	1895	New Delhi
State Bank of India	1955	Mumbai
Syndicate Bank	1925	Manipal
UCO Bank	1943	Kolkata
Union Bank of India	1919	Mumbai
United Bank of India	1950	Kolkata
Vijaya Bank	1931	Bangalore

RAMON MAGSAYSAY AWARD

The **Ramon Magsaysay Award** is Asia's highest honor and is widely regarded as the region's equivalent of the Nobel Prize. It celebrates the memory and leadership example of the third Philippine president after whom the award is named, and is given every year to individuals or organizations in Asia who manifest the same selfless service that ruled the life of the late and beloved Filipino leader.

The Ramon Magsaysay Award Foundation was created in 1957, the year the Philippines lost in a plane crash a President who was well-loved for his simplicity and humility, his passion for justice, particularly for the poor, and his advancement of human dignity. Among the many friends and admirers of the late President around the world were the Rockefeller brothers. With the concurrence of the Philippine government, the trustees of the Rockefeller Brothers Fund (RBF) established the Award to honor his memory and perpetuate his example of integrity in public service and pragmatic idealism within a democratic society.

Supported with a generous endowment from the RBF, the Ramon Magsaysay Award Foundation (RMAF) was organized in Manila in May 1957, with seven prominent Filipinos as founding members of the foundation's board of trustees. The Foundation has since implemented the Magsaysay Award program, pursuing the mission of "honoring greatness of spirit in selfless service to the people of Asia". The first Ramon Magsaysay Awards were given on August 31, 1958 to five outstanding individuals working in India, Indonesia, Philippines, Republic of China (Taiwan) and Sri Lanka, and a Philippine-based organization.

The Ramon Magsaysay Award program is managed by the RMAF board of trustees composed of seven Filipinos and two foreign Awardees serving staggered four-year terms.

Annually, the RMAF solicits award nominations from a wide-ranging pool of international nominators. Nominations are carefully investigated and the awardees are determined after rigorous evaluation by the Foundation's board of trustees. Presentation Ceremonies are held annually in Manila on 31 August, the birth anniversary of the late President.

With strong international presence and support, the Ramon Magsaysay Award Foundation continues to honor persons and organizations as exemplars of selfless leadership, whose lives and work make Asia truly a better place by:

- Addressing issues of human development across boundaries of culture, politics and religion with courage and creativity
- Inspiring young people in Asia and elsewhere to apply their talents and energies to selfless and innovative service
- Preserving the values of integrity, respect for human dignity, and principled governance that characterized the late president Ramon Magsaysay

The Magsaysay laureates, through their ideas and programs, exert strong individual and collective influence as a community of moral leaders who promote just, democratic and sustainable responses to the challenges of human development throughout the Asian region. The Foundation's work is supported by stable organizational resources and strong working relationships with local and international partners. Because of this, the development initiatives of the Magsaysay laureates are better known and more accessible to the public, and are increasingly supported by media and other relevant institutions within and outside Asia.

Each Magsaysay Award winners will receive a certificate, a medallion bearing the likeness of the late President, and a cash prize.

Mission

The mission of the Ramon Magsaysay Award Foundation is to honor outstanding individuals and organizations working in Asia who manifest greatness of spirit in service to the people of Asia.

Ramon Magsaysay Award Winner 2014

The Ramon Magsaysay Award Foundation (RMAF) announced that this year five individuals and one organization from Afghanistan, China, Indonesia, Pakistan, and the Philippines will receive Asia's premier prize, the Ramon Magsaysay Award. The awardees are:

Hu Shuli, from China. She is being recognized for “her unrelenting commitment to truthful, relevant, and unassailable journalism, her fearless promotion of transparency and accountability in business and public governance, and her leadership in blazing the way for more professional and independent-minded media practices in China.”

Saur Marlina Manurung, from Indonesia. She is being recognized for “her ennobling passion to protect and improve the lives of Indonesia’s forest people, and her energizing leadership of volunteers in SOKOLA’s customized education program that is sensitive to the lifeways of indigenous communities and the unique development challenges they face.”

Omara Khan Masoudi, from Afghanistan. He is being recognized for “his courage, labor, and leadership in protecting Afghan cultural heritage, rebuilding an institution vital for Afghanistan’s future, and reminding his countrymen and peoples everywhere that in recognizing humanity’s shared patrimony, we can be inspired to stand together in peace.”

Wang Canfa, from China. He is being recognized for “his discerning and forceful leadership—through scholarly work, disciplined advocacy, and pro bono public interest litigation—in ensuring that the enlightened and competent practice of environmental law in China effectively protects the rights and lives of victims of environmental abuse, especially the poor and the powerless.”

Randy Halasan, for Emergent Leadership, from the Philippines. He is being recognized for “his purposeful dedication in nurturing his Matigsalug students and their community to transform their lives through quality education and sustainable livelihoods, doing so in ways that respect their uniqueness and preserve their integrity as indigenous peoples in a modernizing Philippines.”

The Citizens Foundation, from Pakistan. The organization is being recognized for “the social vision and high-level professionalism of its founders and those who run its schools, in successfully pursuing their conviction that, with sustained civic responsiveness, quality education made available to all—irrespective of religion, gender, or economic status—is the key to Pakistan’s brighter future.”

SARASWATI SAMMAN

The **Saraswati Samman** is an annual award for outstanding prose or poetry literary works in any Indian language listed in Schedule VIII of the Constitution of India. It is named after an Indian goddess of learning and is considered to be among the highest literary awards in India. The award consists of Rs 10 lakh, a citation and a plaque. The Saraswati Samman was instituted in 1991 by the **K. K. Birla Foundation**. Candidates are selected from literary works published in the previous ten years by a panel that included scholars and former award winners.

Winner's of Saraswati Samman

Year	Winner	Works
2013	Govind Mishra	For his book Dhool Paudho Par published in 2008
2012	Sugathakumari	For the collection of her poems, titled 'Manalezhuthu'
2011	A.A. Manavalan	For Irama Kathaiyum Iramayakalum
2010	S. L. Bhyrappa	For Mandra
2009	Surjit Paatar	For Lafzan Di Dargah
2008	Lakshmi Nandan Bora	For his novel Kayakalpa
2007	Naiyer Masud	For his collection of short stories Taoos Chaman Ki Myna (The Myna from Peacock Garden) written in Urdu
2006	Jagannath Prasad Das	For his collection of poems Parikrama in Oriya
2005	K. Ayyappa Panicker	For his collection of poems Ayyappa Panikarude Kritikal in Malayalam
2004	Sunil Gangopadhyay	For his novel Pratham Alo in Bengali
2003	Govind Chandra Pande	For his collection of 163 Sanskrit poems entitled Bhagirathi
2002	Mahesh Elkunchwar	For his play Yugant in Marathi
2001	Dalip Kaur Tiwana	For her novel Katha Kaho Urvashi in Punjabi

2000	Manoj Das	For his novel Amruta Phala (The Nectar Fruit) in Oriya
1999	Indira Parthasarathy	For her play Ramanujar in Tamil
1998	Shankha Ghosh	For his anthology Gandharba Kabita Guccha in Bengali
1997	Manubhai Pancholi	For his book Kurukshetra in Gujarati
1996	Shamsur Rahman Faruqi	For She`r-e Shor-Angez in Urdu
1995	Balamani Amma	For poetry collection Nivedyam in Malayalam
1994	Harbhajan Singh	For his book of poetry Rukh Te Rishi in Punjabi
1993	Vijay Tendulkar	For his play Kanyadaan in Marathi
1992	Ramakant Rath	For his poetry Sri Radha in Oriya
1991	Harivanshrai Bachchan	For his autobiography in four volumes in Hindi

COMMITTEE-COMMISSION FORMED IN INDIA

Committee / Commission	Appointed in	Report Submitted	Mandate
Ashok Mehta Committee	1977	1978	On Panchayati Raj institutions
Balwant Rai Mehta Committee	1957	1957	Recommendations on decentralization system
Chelliah Committee	1991	1992	Recommendations on Indian Fiscal Policy
Kalelkar Commission	1953	1955	First Commission for Backward Classes Commission
Kothari Commission	1964	1966	Education Reform
Malhotra Committee	1993	1994	Insurance Sector Reforms
Mandal	1979	1980	Identify the socially or educationally backward

Commission			class
Narasimham Committee	1998	1998	On Banking Sector Reforms
Naresh Chandra Committee	2011	2012	Defense reforms
Phukan Commission	2001	2005	Corruption in Defense Deals in the wake of the controversy generated by the Tehelka tapes
Sachar Committee	2005	2006	Examine social, economic and educational condition of the Muslim community of India
Sarkaria Commission	1983	1988	To examine the relationship and balance of power between state and central governments
Shah Nawaz Committee	1955	1956	To look into the circumstances around Subhas Chandra Bose's death
Srikrishna Commission	1993	1998	1992 Bombay riots
Srikrishna committee	2010	2010	To look into the demand for separate statehood for Telangana
Thakkar Commission	1984	1986	Inquiry set up to probe Indira Gandhi's assassination
Vohra Committee	1993	1993	Criminalisation of politics

FAMOUS INDIAN WITH BIRTHDAY

Birthday	Name	Died Year	Famous for
340BC	Chandragupta Maurya	298BC	Founder of Maurya Empire
304BC	Ashoka	232BC	Greatest Indian Ruler of all time
335AD	Samudragupta	380AD	King of Gupta dynasty, known as Napoleon of India
1148	Prithviraj Chauhan	1192	Rajput ruler of Ajmed and Delhi
15th April, 1469	Guru Nanak	22th September, 1539	Founder of the religion of Sikhism
14th February, 1483	Babur	26th December, 1530	Founder of Mughal dynasty in India

14th October, 1542	Akbar	27th October, 1605	Greatest ruler of Mughal dynasty
20th September, 1569	Jahangir	8th November, 1627	Sultan of Mughal dynasty
5th January, 1592	Shah Jahan	22th January, 1666	Sultan of Mughal dynasty
4th November, 1618	Aurangzeb	3rd March, 1707	Sultan of Mughal dynasty
19th February, 1627	Shivaji	3rd April, 1680	Founder of Maratha Empire
20th November, 1750	Tipu Sultan	4th May, 1799	Ruler of Mysore Kingdom
27th December, 1797	Mirza Ghalib	15th February, 1869	Famous poet during late Mughal Period
12th February, 1824	Maharshi Dayanand Saraswati	30th October, 1883	Hindu religious leader
4th September, 1825	Dadabhai Naoroji	30th June, 1917	First Indian MP in British Parliament
19th July, 1827	Mangal Pandey	8th April, 1857	First martyr of sepoy mutiny, 1857
19th November, 1828	Rani Lakshmi Bai	18th June, 1858	Rani of Jhansi, leader of Indian rebellion 1857
3rd March, 1839	Jamsetji Nusserwanji Tata	19th May, 1904	Founder of TATA Group
23rd July, 1856	Bal Gangadhar Tilak	1st August, 1920	Social reformer and leader of Indian Independence Movement
6th May, 1861	Motilal Nehru	6th February, 1931	Lawyer and two time President of Indian Congress
7th May, 1861	Rabindranath Tagore	7th August, 1941	Famous Indian Literature and Poet and also first Nobel Prize receiver from India and Asia

25th December, 1861	Pandit Madan Mohan Malaviya	1946	Leader of Indian Independence Movement and founder of Banaras Hindu University
28th January, 1865	Lala Lajpat Rai	17th November, 1928	Known as Punjab Kesari and Leader of Indian Independence Movement
2nd October, 1869	Mohandas Karamchand Gandhi	30th January, 1948	Father of Nation
15th August, 1872	Sri Aurobindo	5th December, 1950	Indian freedom fighter and spiritual leader
31st October, 1875	Vallabhbhai Patel	15th December, 1950	Leader of Indian Independence Movement and first Home Minister of India
13th February, 1879	Sarojini Naidu	2nd March, 1949	Known as Nightingale of India and first Governor of India
31st July, 1880	Munshi Premchand	8th October, 1936	Famous Indian writer in Hindi Language
3rd December, 1884	Rajendra Prasad	28th February, 1963	First President of India
11th November, 1888	Maulana Azad	22th February, 1958	First Education Minister of India
14th November, 1889	Jawaharlal Nehru	27th May, 1964	First Prime Minister of India
14th April, 1891	Dr. B. R. Ambedkar	6th December, 1956	Chief architect of the Indian Constitution
23rd January, 1897	Subhas Chandra Bose	1945	Prominent leader of Indian Independence Movement and founder of Indian National Army

11th October, 1902	Jayaprakash Narayan	8th October, 1979	Known as Loknayak and prominent social leader of independent India
29th July, 1904	J. R. D. Tata	29th November, 1993	Former Chairman of TATA Group
2nd October, 1904	Lal Bahadur Shastri	11th January, 1966	Second Prime Minister of India
28th September, 1907	Bhagat Singh	23rd March, 1931	Indian revolutionaries of independence movement
30th October, 1909	Homi J. Bhabha	24th January, 1966	Known as "father of Indian nuclear programme" and founder Director of Tata Institute of Fundamental Research
26th August, 1910	Mother Teresa	5th September, 1997	Recipient of Nobel Peace Prize
8th July, 1914	Jyoti Basu	17th January, 2010	Five time Chief Minister of West Bengal and Longest Serving Chief Minister of Any State of India
16th September, 1916	M.S. Subbulakshmi	11th December, 2004	Renowned carnatic vocalist and winner of Bharat Ratna
19th November, 1917	Indira Gandhi	31st October, 1984	First Lady Prime Minister of India
21st August, 1919	Vikram Sarabhai	31st December, 1971	Father of Indian Space Program and Chairman of ISRO
31st August, 1919	Amrita Pritam	31st October, 2005	Punjabi Writer and Poet
2nd May, 1921	Satyajit Ray	23rd April, 1992	Famous Film Director, Producer, Writer
4th February, 1922	Pandit Bhimsen Joshi	24th January,	Indian vocalist and

		2011	recipient of Bharat Ratna
28th September, 1929	Lata Mangeshkar		Famous Indian Singer
28th December, 1932	Dhirubhai Ambani	6th July, 2002	Founder of Reliance Group
3rd November, 1933	Amartya Sen		Indian Economist and Nobel Prize winner

LIST OF SOURCES OF VITAMINS LACK OF ACTION AND EFFECTS

Name	Source of Vitamins	Physiology Effect	Effect of reduction
Vitamin-A	Milk, butter, eggs, liver and fish oil	Veins synthesis of vision, growth and development of Apithilliami levels	Building squamous cells of the cornea and skin, night blindness, frustrated rise
Vitamin -D	Butter, liver and fish oil, kidneys, eggs, skin and on top, photosynthesis in sunlight	Business calcium phosphorus metabolism, growth of bones and teeth	Drought disease in children, in adults Ostiaomailesia
Vitamin E (Tokoferol)	Oil, wheat, egg yolk and soybeans	Epicyte protection, genetic enhancement of epithelium, muscle function	Lack of fertility, genital and muscle weakening
Vitamin- k (Neffhokvinon or Fillokvinon)	Green leaves, egg, liver, tomatoes, cabbage, soybeans, intestinal bacteria	In liver synthesis of prothrombin	The blood clot injury or discharge of blood from freezing over
Vitamin B1 (Thiamin)	Cereals, legumes, soybeans, milk, yeast, egg, meat	Carbohydrate and amino acid metabolism enzymes necessary for the co-enzyme	Beri-beri
Vitamin B2 (Raiboflavin)	Cheese, eggs, yeast, green, leaves, meat and liver	Hsieh-enzyme important in metabolism, tearing and components of FMN	Cilosis

Vitamin B3 (nicotinic acid)	Yeast, Mason, liver, fish, egg, Did, peas, nuts and legumes	Hsieh-enzyme NAD and NADP important component of metabolism	Pellagra
Vitamin B5 (Pantothynik acid)	Poultry, meat, liver, milk, tomatoes, peanuts and sugarcane	Hsieh-enzyme component of catabolism	Skin diseases, increased work, gray, ulcers and low fertility
Vitamin B6 (Pairodoksin)	Yeast, meat, liver, milk, fish, cereals	Existence of essential enzymes in protein metabolism enzyme	Hematology impairment, skin diseases and muscular spasm
H or vitamin B7 (biotin)	Meat, wheat, egg, peanuts, chocolate, vegetable, fruit, and yeast	Amina and fatty acid synthesis reactions, including other substances Hsieh-enzyme	Skin diseases, hair loss
Vitamin B12 (Saynokobol-Amine)	Meat, fish, eggs, liver, milk, vegetables, gut bacteria	Rrudiranuo build growth, Nuklik acid synthesis	Hematology impairment, nervous system disturbances
Vitamins Ascorbic acid)	Citrus fruits, tomatoes, vegetables, potatoes, other fruits	Inter-cellular cement, collagen fibers, the matrix of the bones, teeth dentin build	Scurvy
Folic acid	Green leaves, liver, soybeans, yeast, kidney, legumes, gut bacteria	Rudiranuo rise building, DNA synthesis	Hematology impairment, dull wit

ALLOYS IN CHEMISTRY.

Name	Composition	Use
Brass	Cu (60 to 80%), Zn (40 to 20%)	For making household utensils
Bronze	Cu (75 to 90%), Sn (25 to 10%)	For making coins, idols, utensils
German Silver	Cu (60%), Zn (25%), Ni (15%)	For making utensils
Magnelium	Mg (5%), Al (95%)	For making aircraft frame
Rolled Gold	Cu (90%), Ni (10%)	For making cheap ornaments
Monel metal	Cu (70%), Ni (30%)	For making alkali resistant

		containers
Bell metal	Cu (80%), Sn (20%)	For making bells
Gun metal	Cu (85%), Zn (10%), Sn (5%)	Used for engineering purposes
Solder	Sn (50-75%), Pb (50-25%)	Soldering of metals
Duralium	Al (95%), Cu (4%), Mg (0.5%), Mn (0.5%)	In aircraft manufacturing
Steel	Fe (98%), C (2%)	For making nails, screws, bridges
Stainless Steel	Fe (82%) Cr, Ni (18%)	For making cooking utensils, knives

LIST OF ORES OF METALS

Names of the Elements	Ores	Chemical Formulae
Aluminium (Al)	(a) Bauxite	$\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
	(b) Corundum	Al_2O_3
	(c) Kryolite	Na_3AlF_6
Iron (Fe)	(a) Haematite	Fe_2O_3
	(b) Magnetite	Fe_3O_4
	(c) Iron Pyrite	FeS_2
	(d) Siderite	FeCO_3
Copper (Cu)	(a) Copper Pyrite	CuFeS_2
	(b) Copper Glance	Cu_2S
	(c) Malachite	$2\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$

Names of the Elements	Ores	Chemical Formulae
Zinc (Zn)	(a) Zinc Blende	ZnS
	(b) Calamine	ZnCO_3
Sodium (Na)	(a) Rock Salt	NaCl
	(b) Sodium Carbonate	Na_2CO_3
Potassium (K)	(a) Karnalite	$\text{KCl MgCl} \cdot 6\text{H}_2\text{O}$
	(b) Salt Petre	KNO_3
Lead (Pb)	(a) Galena	PbS
	(b) Anglesite	PbCl_2
Tin (Sn)	(a) Tin Pyrites	$\text{Cu}_2\text{FeSnS}_4$
	(b) Cassiterite	SnO_2
Silver (Ag)	(a) Silver Glance	Ag_2S
Gold (Au)	(a) Calverite	AuTe_2

	(b) Syvanite	AgAuTe ₂
Mercury (Hg)	(a) Cinnabar	HgS
	(b) Calomel	Hg ₂ Cl ₂
Magnesium (Mg)	(a) Dolomite	MgCO ₃ . CaCO ₃
	(b) Karnalite	KCl MgCl ₂ . 6H ₂ O
Calcium (Ca)	(a) Lime Stone	CaCO ₃
	(b) Dolomite	MgCO ₃ . CaCO ₃
Phosphorous (P)	(a) Phosphorite	Ca ₃ (PO ₄)
	(b) Floreapetite	3Ca ₃ (PO ₄) ₂ CaFe ₂

SOME IMPORTANT FACTS OF HUMAN BODY

Length of Alimentary Canal	Approximately 8 metres
BMR (Basal Metabolic Rate)	1600 K. Cal / day
Number of Cells in Body	75 trillion
Longest Bone	Femur (Thigh bone)
Smallest Bone	Ear ossicle, stapes
Weight of Brain	1400 gms
Blood Volume	6.8 litres (in 70 kg body)
Normal B.P	120 / 80 mm Hg
Number of R.B.C	(a) In Male : 4.5 - 5.0 million / cubic mm.
	(b) In Female : 4.0 - 4.5 million / cubic mm
Life Span of R.B.C	120 days
Normal W.B.C Count	5000 - 1000 / cubic mm
Life Span of W.B.C	3 - 4 days
D.L.C. (Differential Leucocyte Count)	(a) Basophils : 0.5 - 1%
	(b) Eosinophils : 1 - 3%
	(c) Monocytes : 3 - 8%
	(d) Neutrophils : 40 - 70%
	(e) Lymphocytes : 2 - 25%
Blood Platelets Count	2,00,000 - 4,00,000 / cubic mm
Haemoglobin	(a) In Male : 14 - 15.6 gm / 100 c.c. of blood
	(b) In Female : 11 - 14 gm / 100 c.c. of blood
Hb Content in Body	500 - 700 gm
Universal Blood Donor	O Rh -ve

Universal Blood Recipient	AB
Blood Clotting Time	2 - 5 minutes
Average Body Weight	70 kg
Normal Body Temperature	98.4° F or 37° C
Breathing Rate	16 - 20 / minute
Dental Formula	Adult : 2123 / 2123 = 32; Child : 2120 / 2120 = 22 Milk Teeth
Number of Cranial Nerves	12 pairs
Number of Spinal Nerves	31 pairs
Largest Endocrine Gland	Thyroid
Gestation Period	9 months (253 - 266 days)
Normal Heart Beat	72 - 75 / minute
Largest Gland	Liver
Largest Muscle in the Body	Gluteus maximus (Buttock Muscle)
Largest Smooth Muscle	Uterus of Pregnant Woman
Smallest Muscle in the Body	Stapedius
Largest Artery	Abdominal Aorta
Largest Vein	Inferior Venacava
Largest W.B.C	Monocyte
Smallest W.B.C	Lymphocyte
Greatest Regeneration Power	In liver
Longest Nerve	Sciatic
Longest Cell	Neuron (Nerve Cell)
Menstrual Cycle	28 days
Menopause Age	45 - 50 Years
Minimum Regeneration Power	In Brain Cells
Minimum Distance for proper vision	25 cm
Type of Placenta	Haemochorial (Chorioallantoic)
Pulse Rate	72 / minute
Volume of Semen	2 - 4 ml / ejaculation
Normal Sperm Count	200 - 350 million / ejaculation
FSR (normal Erythrocyte Sedimentation rate)	4 - 10 min / hr
Thinnest Skin	Conjunctiva
pH of Gastric Juice	1.4
pH of Urine	6.0
pH of Blood	7.35 - 7.45

pH of Bile	7.5
pH of Pancreatic Juice	8.5
Total Number of Muscles in the Body	639
Total Number of Bones in the Body	206
Largest Organ of Human Body	Skin

ATOMIC TEST IN THE WORLD

Types of Atomic tests - Atmospheric, Underwater, Underground. Science behind Atomic Weapons Testing - Atomic weapons are weapons of mass destruction based on two types of reactions - nuclear fission and fusions reaction.

Nuclear Fission based atomic weapon

In nuclear fission reaction a critical mass is created by combining two sub-critical mass capable to support a chain reaction. There are two ways in which a critical mass can be created. In the gun-type method, sub-critical masses of fissionable material are placed a little apart from one another in a device similar to a gun barrel. A powerful conventional explosive is packed behind one piece, the fuse is triggered and the explosive goes off propelling one of the sub-critical masses into the other at high speed. A combined mass become super-critical and initiates the self-sustaining chain reaction. For example, the bomb dropped on Hiroshima used the gun-type method.

The other method is the implosion method. A spherical sub-critical mass is surrounded by conventional explosives. The explosive goes off on detonation, compressing the sub-critical mass into high density supercritical mass resulting into a high density supercritical mass resulting into chain reaction. For example the atom bomb dropped on Nagasaki was of the implosion type.

Nuclear Fusion based atomic weapons

In fusion weapons, the power comes from the fusion or combination of lightweight nuclei under intense heat, the reason why they are also called thermonuclear weapons. The nuclei of the isotopes of hydrogen, deuterium and tritium, are fused. The product of fusion weight less than the combined original nuclei and the lost matter turns into energy. The very high temperature required for fusion is achieved by means of fusion explosion. The explosion of the fission device also release neutrons which strike against a compound of lithium-6 deuteride inside the weapon. On being struck by neutrons the compound gives rise to helium and tritium. Now pairs of one tritium nuclei, pair of deuterium nuclei and pair of one tritium-one deuterium nuclei combine to form helium nuclei. As some amount of matter from the deuterium and tritium nuclei is converted into a large amount of energy a

thermonuclear explosion takes place. The explosive power of the weapon is increased by surrounding lithium-6 deuteride with U-238 because the thermonuclear explosion fissions the uranium-238. The device is also known as hydrogen bomb as isotopes of hydrogen are responsible for its explosive power.

Nuclear Reactor Technology

A nuclear reactor is a device in which nuclear chain reactions are initiated, controlled, and sustained at a steady rate. The most significant use of nuclear reactors is as an energy source for the generation of electrical power and for the power of propulsion in nuclear submarines.

The physics of operating a nuclear reactor is explained by Nuclear reactor physics. The natural uranium is the fuel used in the reactor and consists of two types of isotopes - U 238 and U-235 in the ratio of 139:1. The U-235 isotope undergoes fission and release energy. When a slow neutron strikes U-235 atom, it splits into two or more fragments and two or three fast neutrons. Tremendous amount of energy is produced in this process. The fast neutrons are made to slow down before they strike other U-235 atoms, thus releasing chain reaction is attained in due course of time.

Classifications

Nuclear Reactor are classified by several methods such as based on nuclear reaction, moderator material, coolant, phase of fuel, use etc. A brief outline of these classification schemes is provided below.

Nuclear fission - Most reactors, and all commercial ones, are based on nuclear fission. They generally use uranium and its product plutonium as nuclear fuel cycle is also possible. Fission reactors can be divided roughly into two classes, depending on the energy of the neutrons that sustain the fission chain reaction. Thermal reactors use slowed or thermal neutrons and fast neutron reactors use fast neutrons to cause fission in their fuel. they do not have a neutron moderator and use less moderating coolants.

Light water moderated reactors (LWRs) - Light water reactors use ordinary water to moderate and cool the reactors. At operating temperature, the density of water drops because of increase in its temperature, and fewer neutrons passing through it are slowed enough to trigger further reactions. Due to the extra thermalization, these types can use natural uranium/unreached fuel.

Name of Nuclear Explosions	Country	Yield (Kt)	Year
Trinity	USA	19	1945

Little Boy	USA	15	1945
Fat Man	USA	21	1945
RDS-1	USSR	22	1949
Hurricane	UK	25	1952
Ivy Mike	USA	10,400	1952
Joe 4	USSR	400	1953
Castle Bravo	USA	15,000	1954
RDS-37	USSR	1,600	1955
Grapple X	UK	1800	1957
Gerboise Bleue	France	70	1960
Tsar Bomba	USSR	57000	1961
596	China	22	1964
Test No. 6	China	3300	1967
Canopus	France	2600	1968
Smiling Buddha	India	12	1974
Pokhran-II	India	60	1998
Chagai-I	Pakistan	36-40	1998
2006 North Korea Nuclear Test	North Korea	less than 1 Kt	2006
2009 North Korea Nuclear Test	North Korea	5-15	2009

INDIAN SPACE RESEARCH ORGANIZATION (ISRO) CENTERS

Vikram Sarabhai Space Center (VSSC), Thiruvananthapuram, Kerala

The major programmes at VSSC include launch vehicle projects of Polar Satellite Launch Vehicles (PSLV), Geosynchronous Satellite Launch Vehicles (GSLV Mark II and Mark III), Rohini Sounding Rockets, Space-capsule Recovery Experiments, Reusable Launch Vehicles and Air Breathing Propulsion for Advanced Reusable Launch Vehicles.

ISRO Satellite Centre (ISAC), Bangalore, Karnataka

ISAC is functionally organised into five major areas: mechanical systems area including structures, thermal systems and spacecraft mechanisms; digital and communications area including digital systems and communication systems; integration and power area comprising spacecraft checkout, systems integration and power systems; controls and mission area consisting of control system, mission development and computer and information; and facilities.

Satish Dhawan Space Centre (SDSC), SHAR, Shriharikota, Andhra Pradesh

SDSC SHAR, with two launch pads is the main launch centre of ISRO located at 100 km north of Chennai. SDSC SHAR has the necessary infrastructure for launching satellite into low earth orbit, polar orbit and geostationary transfer orbit. The launch complexes provide complete support for vehicle assembly, fuelling, checkout and launch operations. Apart from these, it has facilities for launching sounding rockets meant for studying the earth's atmosphere.

Liquid Propulsion System Centre (LPSC), Thiruvanthapuram, Kerala

LPSC Valiamala is the Headquarters and the centre is entrusted with the responsibility of research and development of Earth Storable and Cryogenic propulsion and delivers Engines, stages, associated control systems and components for Launch Vehicle and Spacecrafts.

Major achievement:

- Liquid Rocket Stages and Control Power Plant for PSLV
- Liquid stage for GSLV
- Propulsion system for GEOSAT and IRS spacecrafts
- Propulsion system for SPE
- Transducer development and production
- LPSC delivered administration package of COWAA software ,which is currently being used across all ISRO centres

Space Applications Centre (SAC), Ahmedabad, Gujarat

Space Applications Centre (SAC) is one of the major centres of the Indian Space Research Organisation (ISRO). It is a unique centre dealing with a wide variety of disciplines comprising design and development of payloads, societal applications, capacity building and space sciences, thereby creating a synergy of technology, science and applications. The Centre is responsible for the development, realisation and qualification of communication, navigation, earth & planetary observation, meteorological payloads and related data processing and ground systems.

National Remote Sensing Centre (NRSC), Hyderabad, Andhra Pradesh

NRSC at Hyderabad has been converted into a full-fledged centres of ISRO since September 1, 2008. Earlier, NRSC was an autonomous body called National Remote Sensing Agency

(NRSA) under Department of Space (DOS). The Centre is responsible for remote sensing satellite data acquisition and processing, data dissemination, aerial remote sensing and decision support for disaster management.

Currently NRSC is supplying data from CartoSat - 1, 2, 2A & 2B, ResourceSat - 1 & 2, OceanSat, TES, IRS - 1D and IMS - 1 to the users. The users are ever growing and utilized about 67,000 data products during 2010-11 in comparison with that of 50,000 during 2009-10.

ISRO Telemetry Tracking and Command Network(ISTRAC), Bangalore, Karnataka

ISTRAC is responsible for providing Space Operation services that include spacecraft control, TTC support services and other related projects and services, for the launch vehicle and low earth orbiting spacecraft and deep space missions of ISRO and other space agencies around the world. Development of RADAR systems for tracking & atmospheric applications and Establishment of Ground Segment Network for Indian Regional Navigation Satellite System of ISRO are the additional responsibilities of ISTRAC.

Master Control Facility (MCF), Hassan, Karnataka & Bhopal, Madhya Pradesh

MCF at Hassan in Karnataka and Bhopal in Madhya Pradesh monitors and controls all the geo-stationary satellites of ISRO. MCF carries out operations related to initial orbit raising of satellites, in-orbit payload testing, and on-orbit operations throughout the life of these satellites. The operations involve continuous tracking, telemetry and commanding, special operations like eclipse management, station-keeping manoeuvres and recovery in case of contingencies.

ISRO Inertial Systems Unit (IISU), Thiruvananthapuram, Kerala

ISRO Inertial Systems Unit (IISU) at Thiruvananthapuram has been the center of excellence in the area of inertial systems for launch vehicles and spacecrafts. IISU carries out research and development in the area of inertial sensors & systems and allied satellite elements. It has facilities for precision fabrication, assembly, clean room and integration and testing. This unit has the total capability to design, engineer, develop, qualify and deliver inertial systems for the entire Indian Space programme.

Laboratory for Electro-Optics Systems (LEOS), bangalore, Karnataka

Laboratory for Electro Optics Systems is engaged in design, development and production of Electro-Optic sensors and camera optics for satellites and launch vehicles. The sensors include star trackers, earth sensors, sun sensors & processing electronics. Optics Systems include both reflective and refractive optics for remote sensing and meteorological payloads. Other optical elements developed by LEOS for in-house use include optics for star sensor, optics for Lunar Laser Ranging Instrument (LLRI), optical masks for sun sensors, optical filters and encoders.

LEOS is actively involved in the development of new technologies for present / future satellites. This includes development active pixel sensor star tracker, Charge Coupled Device (CCD) based star tracker, Fiber Optics Gyro, Optical inter satellite link, high resolution camera optics, optical coatings and MEMS devices (magnetometer, accelerometer etc.). LEOS is situated at Peenya Industrial Estate, Bangalore where the first Indian Satellite Aryabhata was fabricated in 1975.

Development and Educational Communication Unit (DECU), Ahmedabad, Gujarat

Development and Educational Communication Unit (DECU) is involved in the system definition, planning, implementation and socio-economic research/evaluation of satellite-based societal applications.

The Major Programs, at present, of DECU – to promote the satellite-based communication systems to support development, education & training – include:

- Tele-Education
- Tele-Medicine
- Gramsat Program - including Training & Development Communication Channel (TDCC)
- Satcom Applications – including VRC, DMS Program (for S & T), etc.

Regional Remote Sensing Centre – South, Bangalore, Karnataka,
Regional Remote Sensing Centre – West, Jodhpur Rajasthan,
Regional Remote Sensing Centre – East, Kolkata, West Bengal,
Regional Remote Sensing Centre – North, Dehradun, Uttarakhand,
Regional Remote Sensing Centre – Central, Nagpur, Maharashtra

Five Regional Remote Sensing Service Centres (RRSSCs) established under National Natural Resources Management System (NNRMS) by DOS at Bangalore, Jodhpur, Kharagpur (recently relocated to Kolkata), Dehradun and Nagpur have been integrated with NRSC and renamed as Regional Remote Sensing Centres (RRSCs) South, West, East, North and Central respectively on December 2, 2009.

RRSCs support various remote sensing tasks specific to their regions as well as at the national level. RRSCs are carrying out application projects encompassing all the fields of natural resources like agriculture and soils, water resources, forestry, oceanography, geology, environment and urban planning.

Apart from executing application projects, RRSCs are involved in software development, customisation and packaging specific to user requirements and conducting regular training programmes for users in Remote Sensing Application, digital techniques, GIS and theme based applications.

Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram, Kerala

The Indian Institute of Space Science and Technology (IIST), a ‘Deemed to be University’ under Section 3 of the UGC Act 1956, established by the Department of Space, Government of India, offers undergraduate (Avionics, Aerospace Engineering and Physical Sciences), post-graduate and doctoral programmes in niche areas of space science, technology and applications. The institute is committed to a culture of excellence of the highest order in teaching, scholarship and research. IIST fosters state-of-the-art research and development in space studies and creates a think-tank to explore new directions for the Indian space programme.

Indian Institute of Remote Sensing (IIRS), Dehradun, Uttarakhand

The Indian Institute of Remote Sensing (IIRS), unit of Indian Space Research Organisation (ISRO), Department of Space, Government of India is a premier education, training and research institute for capacity building in the field of Remote Sensing, Geo-information, positioning & navigation technology and its applications. Indian Institute of Remote Sensing

(IIRS), formerly known as Indian Photo-Interpretation Institute (IPI), was set up in 1966 under the aegis of the Survey of India to provide comprehensive training with hands on experience of the emerging technology. Institute was merged with National Remote Sensing Agency (NRSA) in July 1976, and in the year 1980, NRSA came under the umbrella of Department of Space (Government of India). Since September 1, 2008, IIRS as part of NRSC was inducted under the ISRO umbrella, and presently IIRS reorganized as a separate entity of ISRO with effect from April 30, 2011.

IIRS endeavor has been to train thematic experts from user community including academic institutions in RS & GIS technology / applications at Post Graduate level with the overall goal of 'technology transfer' and user awareness. The Institute has evolved many programs that are tuned to the different needs of various target groups.

IIRS conducts a variety of courses for the different categories of users including fresh postgraduate students viz., M. Tech., M.Sc., PG Diploma Courses, 2 months NNRMS sponsored courses for University Faculty, 2 weeks on demand Special Courses and 1 week duration Overview Course for Decision Makers.

Physical Research Laboratory (PRL), Ahmedabad, Gujarat

Physical Research Laboratory (PRL) at Ahmedabad, is an autonomous institution supported mainly by DOS. It is a premier institute engaged in basic research in experimental and theoretical physics, astronomy and astrophysics, earth, planetary and atmospheric sciences. The activities cover a wide spectrum of competitive research in all these areas. PRL is also involved in conducting extensive academic programmes for Doctoral and Post Doctoral research and also has an Associateship programme for university teachers. It is also entrusted with the management of the Udaipur Solar Observatory (USO).

National Atmospheric Research Laboratory (NARL), Tirupati, Andhra Pradesh

NARL at Gadanki near Tirupati is an autonomous society supported by Department of Space. NARL has now become one of the prime centers for atmospheric research in the country specializes in basic atmospheric research, indigenous technology development for atmospheric probing and weather and climate modeling. NARL regularly operates a state-of-the-art MST radar, Rayleigh / Mie Lidar, Boundary Layer Lidar, Sodium Lidar, Lower Atmospheric Wind Profiler, Sodar, Disdrometer, Optical Rain Gauge, Dual frequency GPS receiver, Automatic Weather Station apart from regular launching of the GPS balloon sonde. Being relatively young, NARL's research facilities are available for national and international scientists to conduct atmospheric research.

North Eastern Space Applications Centre (NE-SAC), Umiam, Meghalaya

NE-SAC, located at Umiam (near Shillong), Meghalaya, is a joint initiative of DOS and North Eastern Council to provide developmental support to the North Eastern region using space science and technology. The centre has the mandate to develop high technology infrastructure support to enable NE states to adopt space technology inputs for their development. At present, NE-SAC is providing developmental support by undertaking specific application projects using remote sensing, GIS, satellite communication and conducting space science research.

Semi Conductor Laboratory (SCL), Chandigarh, Punjab

Semi-Conductor Laboratory (SCL), formerly known as Semiconductor Complex Limited, is presently a Society under the Department of Space with the main objective to undertake, aid, promote, guide and coordinate the R&D in the field of semiconductor technology, Micro-Electro-Mechanical Systems (MEMS) and process technologies relating to semiconductor processing in the existing 6" wafer fab. SCL has over the years developed and supplied a number of key VLSIs, majority of which have been Application Specific Integrated Circuits (ASICs) for high reliability applications in industrial and space sectors. Steps have been initiated to upgrade the facilities to fabricate devices in 0.25 micron or better technology. SCL continues to strive for technological excellence in the field of semiconductor fabrication.

SATELLITES PROGRAMME IN INDIA

For the past four decades, ISRO has launched 70 satellites for various scientific and technological applications like mobile communications, Direct-to-Home services, meteorological observations, telemedicine, tele-education, disaster warning, radio networking, search and rescue operations, remote sensing and scientific studies of the space.

ISRO has established two major space systems, the Indian National Satellite System (INSAT) series for communication, television broadcasting and meteorological services which is Geo-Stationary Satellites, and Indian Remote Sensing Satellites (IRS) system for resources monitoring and management which is Earth Observation Satellites. ISRO has launched many Experimental Satellites which are generally small comparing to INSAT or IRS, Space Missions to explore the space and Navigation Satellite to provide accurate position information service to users. The following types of satellites are the part of ISRO's space programme:

- Geo-Stationary Satellites

- Earth Observing Satellites
- Navigation Satellites
- Experimental / Small Satellite

SATELLITE LAUNCH VEHICLE

Satellite Launch Vehicle-3 (SLV-3)

Satellite Launch Vehicle-3 (SLV-3), India's first experimental satellite launch vehicle was successfully launched on July 18, 1980 from SHAR Centre Sriharikota, when Rohini satellite, RS-1, was placed in orbit. SLV-3 was a 22 m long, all solid, four stage vehicle weighing 17 tonnes capable of placing 40 kg class payloads in low earth orbit.

It employed an open loop guidance (with stored pitch programme) to steer the vehicle in flight along pre-determined trajectory. The first experimental flight of SLV-3, in August 1979, was only partially successful. Apart from the July 1980 launch, there were two more launches held in May 1981 and April 1983, orbiting Rohini satellites carrying remote sensing sensors.

Augmented Satellite Launch Vehicle (ASLV)

Augmented Satellite Launch Vehicle (ASLV) was developed to act as a low cost intermediate vehicle to demonstrate and validate critical technologies. With a lift off weight of 40 tonnes, the 23.8 m tall ASLV was configured as a five stage, all-solid propellant vehicle, with a mission of orbiting 150 kg class satellites into 400 km circular orbits. The strap-on stage consisted of two identical 1m diameter solid propellant motors, Under the ASLV programme four developmental flights were conducted.

The first developmental flight took place on March 24, 1987 and the second on July 13, 1988. ASLV-D3 was successfully launched on May 20, 1992, when SROSS-C (106 kg) was put into an orbit of 255 x 430 km. ASLV-D4, launched on May 4, 1994, orbited SROSS-C2 weighing 106 kg. It had two payloads, Gamma Ray Burst (GRB) Experiment and Retarding Potentio Analyser (RPA) and functioned for seven years. ASLV provided valuable inputs for further development.

The Polar Satellite Launch Vehicle (PSLV)

The Polar Satellite Launch Vehicle, usually known by its abbreviation PSLV is the first operational launch vehicle of ISRO. PSLV is capable of launching 1600 kg satellites in 620

km sun-synchronous polar orbit and 1050 kg satellite in geo-synchronous transfer orbit. In the standard configuration, it measures 44.4 m tall, with a lift off weight of 295 tonnes. PSLV has four stages using solid and liquid propulsion systems alternately. The first stage is one of the largest solid propellant boosters in the world and carries 139 tonnes of propellant. A cluster of six strap-ons attached to the first stage motor, four of which are ignited on the ground and two are air-lit.

The reliability rate of PSLV has been superb. There had been 24 continuously successful flights of PSLV, till November 2013 . With its variant configurations, PSLV has proved its multi-payload, multi-mission capability in a single launch and its geosynchronous launch capability. In the Chandrayaan-mission, another variant of PSLV with an extended version of strap-on motors, PSOM-XL, the payload haul was enhanced to 1750 kg in 620 km SSPO. PSLV has rightfully earned the status of workhorse launch vehicle of ISRO.

Geosynchronous Satellite Launch Vehicle(GSLV)

Geosynchronous Satellite Launch Vehicle(GSLV)-Mark I & II, is capable of placing INSAT-II class of satellites (2000 – 2,500 kg) into Geosynchronous Transfer Orbit (GTO). GSLV is a three stage vehicle GSLV is 49 m tall, with 414 t lift off weight. It has a maximum diameter of 3.4 m at the payload fairing. First stage comprises S125 solid booster with four liquid (L40) strap-ons. Second stage (GS2) is liquid engine and the third stage (GS3) is a cryo stage. The vehicle develops a lift off thrust of 6573 kn.

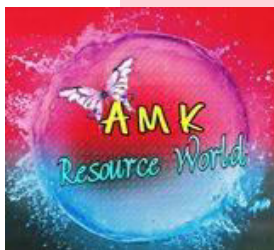
The first flight of GSLV took place from SHAR on April 18, 2001 by launching 1540 kg GSAT-1. It was followed by six more launches , GSLV-D2 on May 8, 2003 (GSAT-2 1825 kg), GSLV-F01 on September 20, 2004 (EDUSAT 1950 kg), GSLV-F02 on July 10, 2006, GSLV-F04 on September 2, 2007 (INSAT-4CR 2130 kg), GSLV-D3 on April 15, 2010, GSLV-F06 on December 25, 2010 and GSLV-D5 on January 05, 2014 (GSAT-14 1982 kg).

Geosynchronous Satellite Launch Vehicle Mark III (GSLV-III)

The GSLV-III or Geosynchronous Satellite Launch Vehicle Mark III , is a launch vehicle currently under development by the Indian Space Research Organization. GSLV Mk III is conceived and designed to make ISRO fully self reliant in launching heavier communication satellites of INSAT-4 class, which weigh 4500 to 5000 kg. It would also enhance the capability of the country to be a competitive player in the multimillion dollar commercial launch market. The vehicle envisages multi-mission launch capability for GTO, LEO, Polar and intermediate circular orbits.

GSLV-Mk III is designed to be a three stage vehicle, with 42.4 m tall with a lift off weight of 630 tonnes. First stage comprises two identical S200 Large Solid Booster (LSB) with 200 tonne solid propellant, that are strapped on to the second stage, the L110 re-startable liquid stage. The third stage is the C25 LOX/LH2 cryo stage. The large payload fairing measures 5 m in diameter and can accommodate a payload volume of 100 cu m. Realisation of GSLV Mk-III will help ISRO to put heavier satellites into orbit.

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