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|  Topic | Learning outcomes | Innovative/Experential learning/ Interdisciplinary/art integration |
| **Ch-2 Sexual reproduction in flowering Plants** • Flower – A Faccinating organ of Angiosperm • Pre- Fertilization structure and events • Stamen , Microsporangium and Pollen grain • Structure of microsporangium and Microsporogenesis • Pistil, Megasporangium and Embryosac formation • Pollination and its Types and its agents • Outbreeding Devices • Pollen pistil interaction • Artificial Hybridizatio• Double Fertilization • Post – Fertilization : Structures and Events – Embryo, Endosperm and Seed formation • Apomixes and Polyembryony | - Students would be able to - identify various parts of flower and locate male and female reproductive parts & pollen grains etc. - analyze different adaptive features of flower for different pollinations. - recognize the beauty of nature. Describe and comprehend about the events involved in the process of double fertilization in plants Understand about the formation of embryo and endosperm (double fertilization) in dicotyledon and monocotyledon seeds, | **Experential learning-** Display of parts of china rose flower,Temporary mount of pollen grain germination etc**Art integration**-drawing of colourful diagrams structure of anther,pollen grain,Anatropous ovule,embryo sacInterdisciplinary-Maths- How many pollen grains and ovules are likely to be formed in the anther and the ovary of an angiosperm bearing 25 microspore mother cells and megaspore mother cells respectivelyI T- ppt of topic- Pollination and its Types and its agents • Outbreeding Devices • Pollen pistil interaction • Artificial Hybridization |
| **Ch-3 Human Reproduction** – • Male and female reproductive system, • Gametogenesis • Menstrual cycle • Fertilization and implantation • Pregnancy and Embryonic Development • Parturition and Lactatio | -Analyse and interpret the role of different hormones in the life span of the organism. -Understand about clones, identical and non identical twins.-Consider the evolutionary advantages of the genetic variation that comes from sexual reproduction | **Experential learning-** permanent slides observations of T.S testis,T.S ovary and T.S of blastulaSelf awareness by knowing about own reproductive organsPROJECT-Male and female reproductive systems**Art integration-**-drawing of colourful diagrams of diagrams of T.S testis,T.S ovary,spermatozoa,development upto implantation etcI**nterdisciplinary**-Maths, How many sperms will be produced from 100 primary spermatocytes and how many eggs will be produced from 100 primary oocytes?  |
| **Ch-4 Reproductive health –** problems and strategies • Population Explosion and Birth control methods • Medical termination of Pregnancy • Amniocentesis • Sexually Transmitted Diseases • Infertility and assisted reproductive technologies | Students will be able to answer- reasoning facts related to the reproductive health - develop awareness of STDs. - List the factors that causes infertility. | INNOVATIVE-PROJECTS-Various contraceptive devicesamniocentensisI**nterdisciplinary-****IT**- ppt on Population Explosion and Birth control methods |
| **Ch-5 Principles of Inheritance and variation** • Mendel’s Laws of Inheritance • Inheritance of one gene theory • Inheritance of two gene theory • Sex determination • Mutation • Genetic disorder | Students have learnt to- Illustrate the monohybrid and dihybrid crosses.- Analyze and infer the cause of blood groups and its importance during blood transfusion.- Understand the importance of blood donation, use of blood bank separation of various blood components. -Apply quantitative problemsolving skills to genetics problems and issues.. -Describe the chromosomal theory, molecular genetics and quantitative and evolutionary genetics. -Synthesize from the concept of gene mutation some genetic disorders can be cured by gene transformations. -Relate the chromosomal abbrebations with real life situationstudents would develop -critical thinking about the expression of trait.. - recognize various genetic phenomena. - find out the possible genotype for the given phenotype in the pedigree of given family. | **Brainstorming**-laws by Mendel**Problem solving method**- **A tall plant with red flowers (dominant) is crossed with a dwarf plant with white flowers (recessive). Work out a [dihybrid cross](https://byjus.com/biology/dihybrid-cross-inheritance-two-genes/) and state the dihybrid ratio. What will be the effect on the dihybrid ratio if the two genes are interacting with each other?** **Art integration-**-drawing of colourful crosses and pedigree chartI**nterdisciplinary**—**Maths** –Calculation of monohybrid ,dihybrid and test cross ratios**IT-** ppt on genetic disorders |
| **Ch-6 Molecular basis of Inheritance** • The DNA• RNA World •DNA Replication • Transcription • Genetic code • Regulation of gene expression • Human Genome Project -DNA Fingerprinting  | Students would be- able to apply information for the construction of DNA model. -develop team spirit while making videos in group. -able to recognize concept and process of replication, transcription and translation. -able to construct model of DNA.- Relate the chromosomal abbrevations with real life situation. -The students will understand the importance of DNA in all activities-The students learnt how DNA finger printing helps in Forensic sciences -The learners learnt about the human genomic project which helped in identifying and preventing many hereditary diseaseses | **Innovative-DNA model making****ART INTEGRATION** -: - Students will create 3D model of DNA by using straws - draw diagram of transcription, translation, replication, lac operon etc |
| **Ch-7 Evolution** • Origin of life • Evolution of Life Forms • Evidences of evolution • Adaptive radiation • Biological Evolution • Mechanism of Evolution • Hardy Weinberg Principle • Human evolutionl | The students would be able to -sKnow about ancient theories of evolution-corelate various types of evidences with different types of organisms-explain about Hardy’s Weinberg principle-how humans are evolved  | I**nterdisciplinary**-**Maths**- **25 individuals in a population are homozygous dominant, then the individuals that are expected to be homozygous recessive are-?****Art integration-**-drawing of colourful family tree of primates,flow chart of evolution of man |
| **Chapter-8: Human Health and Diseases** Pathogens; parasites causing human diseases (malaria, dengue, chikungunya, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse | : Students will be able to- distinguish between acute and chronic diseases. - find and understand information related to the diseases . - develop team spirit. - correlate symptoms with the causative agent and organ it attacks - sensitized toward the drug abuse issue -will understand the need of adopting hygienic ways to prevent diseases - critically understand issues related to corona virus. | **Innovative**-Role play-various diseases ,causative organisms and symptoms**Art integration-**-drawing of colourful diagrams and flow chart of life cycle of plasmodium and replication of HIV in host cell.I**nterdisciplinary**-**English-role play dialogues** |
| **Chapter-10: Microbes in Human Welfare** Microbes in food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicious use. | Students will be able to - list various microbes and its uses. - recognize microbes, bio control agent, bio fertilizer etc. - comprehend the biogas plant and Sewage treatment. | **INNOVATIVE-**Excursion-Visit to a village to see bio gas plant **Project-**Bio gas plant,sewage treatment plant**Art integration** –will make model of biogas plant,draw diagram of biogas plant and sewage treatment. |
|  **Ch-11&12 Biotechnology - Principles and Processes** Genetic Engineering (Recombinant DNA Technology). Tools for recombinant DNA Technology Process of Recombinant DNA technology Biotechnology and its Application • Principles and process of Biotechnology • Genetic engineering • Biotechnological application in Agriculture • Biotechnological Application in Medicines • Transgenic Animals & Ethical Issues | The students learnt the process of r-DNA technology The learners understood how the technology is used in the large scale production of antibiotics, enzymes etc in industries The students learnt about the different techniques which could be applied to transfer the genes. The students learnt about the gene therapy which enabled the medical scientist to replace the defective gene responsible for hereditary disease. Describe the events involved in generating recombinant DNA molecule properties of restriction enzymes, Choice of host cell Use various safety measures while using instruments like laminar air flow bench, centrifuges, autoclave, hot air oven Use of restriction enzyme inDNA and transformation in bacteria Application of PCR in DNA fingerprinting, | INNOVATIVE- sample of some biotechnological product like milk, bread etc, picture of plasmid,PCR etcEXPERE**NTIAL LEARNING-**activity of isolating DNA from spinach or onion extract will be done **Art integration—**Model of plasmid ,structure of insulin |
| **Ch-13 Organisms and Populations** Population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution. (Topics excluded: Organism and its Environment, Major Aboitic Factors, Responses to Abioitic Factors, Adaptations) | The students learnt how adaptation allows organism to survive and reproduce in natural environment The students have learnt to explain how single species population grow and regulate. The learners can distinguish between density dependent and density independent birth and death rates. They will be well versed with the analysis of population data usingstatistics, graphs, life tables, survivor curves. They learnt how community change in both space(biome and gradient)and time(succession) Students will be able to assess survival needs and interaction between organism and environment. Understand how interaction among species such as competition predation, parasitism and mutualism organize a community | **Hands on learning**- Construct a frame to find out population density by quadrant method. Construct a frame to find out population density by quadrant method**Art integration**. - draw graph of population growth I**nterdisciplinary**-IT-ppt on population interactions |
| **Ch-14 Ecosystems**: Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy  | Analysethe roles of organism as a part of interconnected webs, population, communities and ecosystem. Interpret energy flow among population through food web and ecological pyramids Learn to describe the major forces structuring community and explain how community structure can be represented by food webs. Describe how energy from sunlight is transformed through an environment. Analyze the importance of decomposition in ecosystem Describe plant and animal distribution patterns in relation to abiotic and biotic factors.  Define the essential characteristics underlying natural ecosystems. Explain model population and community-level dynamics. Interpret and present ecological results. Identify global environmental problems | Jigsaw learning**Art integration-**-drawing of colourful pyramids of number,biomass and energyPeer group learnings |
| **Ch-15 Biodiversity and its Conservation** Biodiversity-Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites. | The methods of in situ and ex situ for biodiversity conservation Develop Creativity, Decision Making and Logical thinking how and where to implement is only use for betterment of society and environment. Describe the cultural uses of plants for food, fiber, medicine, biotechnology, etc. Discuss plants in the context of broader environmental concerns, such as climate change, habitat destruction, pollution, invasive species, and agriculture Describe methods of how resources are valued. | **Excursion-Deer park**Group learning**Art integration-**-drawing of tables OF endangered and extinct organismsI**nterdisciplinary**-English-all the contentIT- http:// www.lean cbse.in , https://www.youtube.com/watch?v=pfPR0si http://youtu.be/rwDfRCbYwZc |
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