

• **CH#3 ENZYMES**

- Enzymes are globular proteins
- Co factor= bridge between enzyme and substrate
- Non-protein part covalently bonded to enzyme= prosthetic group
- Loosely attached to protein part= coenzyme
- Enzymes simply dissolved in cytoplasm
- Active site of enzymes= binding site+ catalytic site
- pH
- Pepsin 2
- Sucrase 4.5
- Enterokinase 5.5
- Salivary amylase 6.8
- Catalase 7.6
- Chymotrypsin 7-8
- Pancreatic lipase 9
- Arginase 9.7
- Chlorenchymatous cells carry out photosynthesis
- Cell membrane
- 60-80% protein
- 20-40% lipids
- Peptidoglycan= murien
- Large and small subunit of ribosome attachment is controlled by Mg +2 ion
- Old mitochondria digested by lysosomes by autophagy
- Centrioles play a role in formation of cilia
- Undifferentiated cells have 30000 nuclear pores per nucleus
- Erythrocytes have 3-4pores/nucleus
- Chromosome
- Chimpanzee 48
- Onion 16
- Potato 48

• **CH#4 CELL**

- Father of botany- Theophrastus
- Science of exception- bionics
- Physical basis of life was explained by- Huxley
- Lipid synthesis takes place in- smooth ER
- Nucleus discovered by Robert Brown in cells of "orchids"
- The term ribosome was obtained by- Palade
- Plasma membrane also called as cell membrane and unit membrane
- In cell membrane of animals lipid is present about 50%
- Cholesterol absent in plant and bacterial cells
- Plasma membrane ke structure me oligosaccharides are attached to integral proteins whereas glycolipids are directly attached to the layer
- Primary wall 1.3 micrometer
- Sec wall 5-10 micrometer
- Seed hairs of cotton plant- gossypium
- Lamella - Ca and Mg pectate
- Pri wall- hemicellulose cellulose and pectic substances
- Sec wall- cellulose lignin
- No of chromosome in corn 20
- Rough Er present in salivary glands pancreas
- Smooth Er present in lipid producing cells
- Mitochondria 0.2-1nm in diameter and 10 micrometer long
- Enzymes in mitochondria are located in inner membrane (cristae)
- Matrix - energy rich area

- Golgi bodies - 1898 discovered
- Cis face is receiving end of golgi apparatus
- Trans face is shipping side
- Tay Sachs death by age 3
- Gaucher infant form
- Krabbe death by age 2
- Proplastids occur in meristematic tissues
- Glyoxysome fatty acid into sugar
- Microfilaments actin and myosin
- Intermediate vimnetin
- Microtubules tubulin
- Eukaryotes 80s ribosome, small 40s large 60s subunits
- Prokaryotes 70s ribosome, 50s large 30s small subunits
- Ribosomes contain abt 50 diff kinds of proteins Ribosomes are attached to er by large subunits
- Centrosome contain pair of centrioles
- Vacuoles are nonprotoplasmic
- Plant vacuoles act as lysosome
- Homology divergent evolution
- Analogy convergent evolution
- Main tool for classifying organisms- genetics

CHAPTER 5 VIRUS

- Virus can pass through porcelain fibres whereas bacteria cant
- Wendell stanley crystallized viruses
- Virus 20nm-250nm
- No of capsomeres characteristic of a virus
- Tmv- helical or isometric having a rod like appearance
- Antisepsis- procedures to reduce or eliminate possibility of infection
- Rabies also called hydrophobia
- Misuse of antibiotics
- Penicillin- allergic reactions
- Streptomycin- affect auditory nerve causing deafness
- Tetracycline- discolouration of teeth
- Species basic unit of classification
- Allium cepa- onion
- Margulis and Schwartz modified Whittaker scheme by considering
- " cellular organization, mode of nutrition, cytology, genetics and organelles of symbiotic origin"
- Bacteriophage= bacteria eater, discovered by Twort(1915) and D'Herelle(1917)
- Pox virus 250nm
- Parvovirus 20 nm
- Viruses are obligate intracellular parasites
- Viruses are generally resistant to broad range of antibiotics
- 162 capsomeres in herpes virus
- 252 in adenovirus(cause common colds)
- Icosahedral- having 20 faces
- Helical are rod shaped
- T2 and T4 are used in phage studies
- Lysogenic virus:
- Detachment of viral DNA from host's chromosome and beginning of lytic cycle is called induction
- Mumps and measles develop immunity in their victims
- Rna tumor virus- retrovirus-oncovirus
- Hiv is host specified
- Hepatitis A - infectious hepatitis, vaccine available
- serum hepatitis, second major form, vaccine available

- non A non B hepatitis(former name), often leads to chronic liver disease, causes infusion hepatitis, less severe than H A and B, no vaccine is present for H C
- delta hepatitis
- Hepatitis E- can be caused by pig, transmitted through faeces of infected person
- Viral hepatitis is of 7 types (A-G)
- Bacteriophage - 5 diff proteins (tadpole)
- Polio virus- spherical
- Single stranded RNA- HIV
- Double stranded DNA- Hepatitis B
- Adsorption, injection, reproduction, lysis.
- Lytic - virulent
- Lysogenic- temperate
- Tiny molecules of naked RNA- viroids(nuclear gene)
- Infectious protein- prions, misfolded form of protein present in brain cells.
- Aids discovered in 1985
- Rabies discovered by louis pasteur
- Rhabdo virus- rod shaped
- Flu is caused by adeno virus(check)
- Horizontal transmission - external source
- Vertical - inherited from parents
- Hiv affects T cells (T4 or helper)
- "Aids involves defect in cell mediated immunity"
- Skin cancer- kaposi's sarcoma
- Septicemia- blood poisoning
- Sumarin- antiparasitic drug
- Hepatitis A- enveloped RNA virus, transmitted by faeces
- ""Hepatitis B- serum hepatitis, unusual Dna virus(small circular molecule of partly double stranded Dna), 359 nucleotides, viral genome encodes two proteins and Dna polymerase, also causes liver cancer, health problem among Asians, Africans and male homosexuals""
- Hepatitis C - mother to child during pregnancy

CHAPTER 6 PROKARYOTAE

- Bacteria 0.2 to 2 micron in breadth, 2 -10 micron in length
- Volutine granules= intracytoplasmic storage form of complex inorganic polyphosphate
- Flagella originate from basal body
- Bacterial capsule is made up of polysaccharides and protein
- Cell wall has peptidoglycan
- Archaeobacteria do not have peptidoglycan
- Cell membrane in bacteria helps in respiration
- Mesosomes also help in respiration , cell division, dna replication and export of enzyme
- Plasmids provide resistance against antibiotics
- Bacterial chlorophyll was discovered by Von Neil in 1930
- Iron crystals are formed within bacterial cytoplasm
- Conjugation - pilli- laderberg and tatum in 1946
- Transduction - bacteriophage- laderberg and zinder 1952
- Transformation- heat killed having effect on alive- fred griffith 1928
- Riboflavin - vit B2 produced by clostridium
- Vaccination - active immunization
- Oral vaccine - polio
- Injected vaccine- tetanus
- Cyano bacteria pigments- chlorophyll a and phycocyanin
- Single filament - trichome
- Ribosomes pseudovacuoles and reserve food in form of cyanophyceae starch is present in nostoc
- Nostoc- first colonizers of moist soil
- Heterocyst- centre of nitrogen fixation

- Bacteria- pioneers of cellular organization
- Prokaryotic cell wall is composed of polysaccharide chains bound covalently to shorter chains of aminoacids forming peptidoglycan or murien. The entire wall is regarded as molecular comole called "sacculus"
- Bacteria called as animacules by Antony Van Leeuwenhook
- Pasteur- made vaccines for anthrax, fowl cholera and rabies
- Robert Koch- germ theory of disease
- Smallest bacteria(mycoplasma) is the size of largest virus(pox virus)
- Bacteria in brown surgeonfish- Acanthrus nigrofuscus
- True pilli are only present on gram negative bacteria
- Pilli made up of protein pilin
- Cell wall of archaebacteria- proteins, glycoproteins and polysaccharides
- Chromatin body of bacteria visible under light microscope after staining with "Feulgen stain"
- Cysts are not heat resistant
- Green, purple sulphur and purple non sulphur bacteria are photosynthetic
- Pseudomonas(bacilli)- aerobic bacteria
- Spirochete- anaerobic
- E.coli- facultative anaerobic
- Campylobacter- microaerophilic
- Bacteria lack mitosis and traditional sexual repro
- Sterilization- destruction of all life forms, generally gamma rays are used
- Moist heat- coagulation of protein and kills microbes
- Dry heat- oxidation of chem constituents of microbes and kills them
- Chemical substances used on living tissues that inhibit growth of microorganism- antiseptics
- Microbicidal- kills microbes immediately
- Microbistatic- inhibits reproductive capacities and maintains microbial population at constant size

CHAPTER 7 PROTOCTISTA

- Phycoerythrin- red pigment present in red algae
- Chlorella - fresh water flagella
- *algae
- Repro by aplanospores
- Pyrenoids store starch
- Ulva marine alga
- Asexual repro by quadriflagellate zoospores
- Sexual by biflagellate
- Amoeboid stage of slime mold is called plasmodium
- Slime mold cells formed by spore germination are biflagellated
- Water mold asexual repro by biflagellate zoospores
- Sexual repro in water molds discovered by Clinton in 1911
- Protozoa - 30000 species
- Ciliata- balintidium, opalina paramecium
- Suctoria- acineta
- Sporozoa- plasmodium, monocystis
- Flagellata- trypanosoma
- Sarcodina- amoeba, radiolarian ooze and globigerina ooze

CHAPTER 8 FUNGI

- Fungi have a characteristic mitosis- nuclear mitosis
- Multinucleated large cell without hypha- coenocytic
- Armillaria a pathogenic fungus afflicts conifers
- All fungal nuclei are haploid except zygote formed which also directly after fusion divides by meiosis
- Pleurotus ostreatus (pearl oyster) and Arthrotyr are predator fungi and their preys are nematodes
- Saprobic fungi have modified hypha called rhizoid
- Parasitic have called haustoria
- Of vascular plants
- Lichen = fungi + alga

- Mycorrhiza = fungi + plants(roots)
- Ph tolerated 2-9
- Endomycorrhiza = present in surrounding region as well as penetrate
- Ecto = only in surrounding
- Pinus, firs= ectomycorrhiza
- Orchid= endomycorrhiza
- Spores are produced in both asexual and sexual repro
- Fungi store excess food as lipid droplets or glycogen
- Zygomycota
- 600 species
- Lack septa
- Bread molds, black bread molds, mucor, rhizopus
- Smallest group
- Asexual repro more common by sporangia
- Sexual by zygospore
- Saccharomyces crevisiae- fermentation
- Candida- vaginal and oral thrush
- Ascomycota
- Largest group
- 30000 species
- Yeasts morels truffles powdery mildew cup fungi neurospora
- Asexual by conidia
- Sexual by ascocarp
- Also called sac fungi
- Female gametangia has trichogyne for receiving male gametes
- Eight ascospores are formed
- Cup fungi and morels - apothecium
- Neurospora- perithecium
- Deuteromycota
- Fungi imperfecti
- 17000 species
- No sexual reproduction
- Parasexuality occurs
- Penicillium- penicillin, flavour and aroma to cheese
- Aspergillus fermenting soya sauce and soya paste
- Citric acid is also prepared
- Aspergillosis ear lung disease
- Moniliasis gum skin mouth
- Basidiomycota
- 16000 species
- Mushrooms toadstools puffballs jelly fungi shelf fungi rust smut
- Asexual not mentioned in our book therefore sexual more common
- Sexual by basidium
- Also called club fungi
- 4 haploid spores are produced
- Histoplasmosis lung infection
- Aspergillus fumigatus - aflatoxins
- Pink yeast rhodotula on shower curtains Protozoans- ingest their food by endocytosis
- Locomotion
- Amoeba- pseudopodia
- Zooflagellates- flagella
- Actinopods- pseudopodia
- Foraminifera-pseudopodia
- Apicomplexans-none(parasites), most are digenic

- Ciliata- cilia
- Giant amoeba- *Pelomyxa palustris*- most primitive of all eukaryotes, obtain energy from methanogenic bacteria which reside within them
- Trichonymphs- live in gut of termites as symbionts and help in digestion of dry wood
- Micronuclei- sexual repro
- Macronuclei- cell metabolism and growth
- Foraminiferans and actinopods produce shells
- Foraminiferans produce of calcium(have created vast limestone deposits) whereas actinopods of silica
- Radiolarians are actinopods with glassy shell
- Rhodophyta- red algae (no flagella), take part in coral reefs
- Chlorophyta- green algae(have flagella)
- Phaeophyta- brown algae(two flagella on repro cells), helps the largest brown alga
- Chrysophyta-diatoms (no flagella), major producers
- Pyrrophyta- dinoflagellates(two flagella), imp group of producers
- Euglenophyta- euglenoids (two flagella one long one short)
- Marine alga are source of useful substances like algin, agar, carrageenan and antiseptics
- Feeding stage of slimemold- plasmodium
- Plasmodial slimemold *Physarum polycephalum* is a model organism
- Water molds- cell wall made of cellulose
- Cyanobacteria- gram negative
- Oscillatoria- pollution indicator
- Super blue green alga- complete whole food -60% proteins with all essential aminoacids in perfect balance
- Mycologist- who study fungi
- Reproductive structures- mushrooms, puffballs, morels
- Mildews are obligate parasites
- Oyster mushroom- nitrogen requirements by nematodes and carb requirements by breaking wood (omnivorous)
- Fungi grow best in moist habitats
- Rhizopus - black bread mold
- Pilobolus -spitting fungus, both belong to zygomycota(conjugating fungi)
- Morels are mycorrhizal, *Morchella esculenta*
- Puccinia species are most common rust fungi
- Ustilago most common smut
- "Ustilago tritici (loose smut of wheat) spores are teliospores" PAST NTS
- Penicillium - blue green molds
- Aspergillus- brown molds
- Brush like arrangement of conidia is characteristic of penicillium
- Death stool - *Amanita*
- Reindeer moss is a lichen
- Lovastatin used for lowering blood cholesterol
- Cyclosporine- used in organ transplantation
- Ergotamine- to relieve migraine

Griseofulvin- inhibit fungal growth

- **PLANTAE**
- Sporopollenin polymer resistant to all kinds of environmental damage
- Bryophytes dominant gametophyte
- Cuticle noncellular layer of wax like substance cutin
- Paraphyses help to prevent drying of sex organs
- Oospore - zygote
- Hepaticae - liverworts
- Musci - moss, gametophyte with transitory prostrate stage called protonema
- Anthocerotae - hornworts, most advanced group, sporophyte can survive without gametophyte
- *Funaria hygrometrica*- moss
- Protoandry - maturation of male sex organs before female

- Attractant for sperms- sugarcane scent
- Tracheophyta
- Have protective layer of sterile jacket cells around repro organs
- Dominant sporophyte
- Psilopsida
- Living genera Psilotum and Tmespteris
- Rhynia most primitive vascular plant
- One veined leaf- microphyllous
- Many veined leaf- megaphyllous, first step planation, second step webbing
- Lycopsidea- club mosses
- Five genera alive
- Formed Earth's first forest
- Lycopodium- running pine or ground pine, homosporous
- Selaginella- heterosporous
- Sphenopsida- horse tails
- Coal is formed from these plants
- Homosporous
- Pteropsida- ferns
- Evolved from psilopsida
- Leaves are simple but mostly compound
- Homosporous
- Adiantum or dryopteris
- Leaves bearing sori- sporophyll
- Prothallus - gametophyte is independent heart shaped
- Archegonium secretes malic acid at maturity
- Prothallus after formation of sporophyte degenerates
- Spermopsida
- Gametophytes are very reduced
- Heterosporous
- Gymnosperm
- Naked seed
- No fruit
- Cycads declined in cretaceous period but nine genera survive today called sago palms
- Gingko- maidenhair tree
- Best group of gymnosperm- conifer
- Pine - repro structure- cones
- Mature female gametophyte produces 2-5 archegonia
- Pollen grains- multicellular haploid structure, germinated pollen contains six nuclei (4 active and 2 of degenerated cells)
- Angiosperms
- Hv ovary
- Hv fruit
- Ovules enclosed within modified leaves called carpels
- Flower - compressed reproductive shoot with four whorls of modified leaves
- Became dominant in cenozoic era
- Thalamus- receptacle
- Sepals- calyx
- Petals- corolla
- Stamen- androecium
- Carpels- gynoecium
- Seven celled eight nucleate structure- female gametophyte (embryo sac)
- Anther- 4 microsporangia
- Generative nucleus- technically a cell with almost no cytoplasm
- After fertilization

- Ovule- seed
- Ovary- fruit
- Endosperm nucleus- endosperm
- Classification or grouping : taxonomy or systematics
- starts life as a zygote , diploid cell
- cleavage -multicellular >solid ball of mass called morula > hollow ball of cells blastula > blastula invaginates to form gastrula.
- sac like opening in gastrula is called blastopore
- hollow dig sys called enteron if it is open at one end
- Phylum porifera into sub kingdom parazoa and the rest 8 into sub phylum eumetazoa
- eumetazoa form three germinal layers from which organs develop
- germ layers - ectoderm, endoderm mesoderm
- **Rosaceae**
- Important in temperate regions
- Ranks third in commercial importance
- Rosa indica rose
- Pyrus pastia- tobacco pipes
- Crataegus and cotoneaster- walking sticks
- Rose water- eye diseases
- Pyrus malus- apple
- Pyrus communis- pear
- Pyrus persica- peach
- Pyrus amygdalus- almond
- Phylum porifera is not divided into parazoa and eumetazoa
- Porifera is placed in sub kingdom parazoa and the rest 8 are placed in eumetazoa
- Solanaceae - nightshade or potato family
- Ovary obliquely placed
- Family provide drugs and food
- Brinjal- egg plant- Solanum melongena
- Fruit of capsicum rich in vit A and C
- Physalis- ground cherry- husk tomato
- Atropa belladonna - deadly nightshade- atropine- medicinal imp
- Datura (james town weed) - daturine- medicinal imp
- Solanum tuberosum- potato
- Lycopersicum esculentum- tomato
- Capsicum annum- red pepper
- Petunia alba- petunia
- Solanum nigrum- black nightshade
- Datura alba- thorn apple
- Nicotiana tabacum- tobacco
- Cestrum nocturnum- lady of the night
- Fabaceae - papilionaceae- pea family
- vexillary aestivation - papilionaceous corolla
- Medicinal imp
- Family is a source of high protein food
- Pulses belong to this family
- Cicer arietinum- channa- gram pea
- Pisum sativum- pea
- Lens esculenta- masure
- Phaseolus aureus- mung
- Phaseolus mung- urad
- Phaseolus vulgaris- kidney bean
- Medicago sativa, alfalfa - lusan
- Timber plants- butea , dalbergia

- *Arachis hypogaea*- peanut
- *Indigofera tinctoria*- neel- indigo dye
- *Butea monosperma*- yellow dye
- *Glycyrrhiza glabra*- cough and cold
- *Clitoria termatea*- snake bite
- *Abrus precatorious*- ratti
- *Lathyrus odoratus*- sweet pea
- *Dalbergia sisso*- red wood
- *Sesbania aegyptica*- sesbania
- *Caesalpinacea*- cassia family
- Medicinal, ornamental and food imp
- *Cassia fistula*- amaltus- cure ring worm and skin disease
- *Cassia senna* and *cassia obovata*- drug senna used as laxative
- *Cynometra cauliflora*- oil used for skin disease
- *Bauhinia verigata*- camels foot- kachnar- used as vegetable
- *Haematoxylon*- long wood- dye hematoxylin
- *Bauhinia perpurea*, *tamarus indicus*(imli) - barks used for tanning
- *Poinciana regia*- flame of the forest- ornamental
- *Parkinsia roxburgai*- vilayati kinar- ornamental
- *Poaceae*- *Graminae*- Grass family
- Imp as it provides food fodder ornamentals
- Composed of units called spikelets
- Two lower bracts - glumes are empty
- Perianth(calyx+corolla) is represented by lodicule
- Stigma feathery
- *Triticum indicum*- wheat
- *Avena sativa*- oats
- *Oryza sativa*- rice
- *Zea mays*- indian corn
- *Saccharum officinarum*- sugar cane- sugar is obtained
- *Hordeum vulgare*- barley
- *Pennisetum typhoideum*- bajra
- *Bambusoideae*- bamboo - vegetable and soup dish
- *Mimosaceae*- acacia family
- *Albizia lebbek*- siris- cabinet wood and railway carriages
- *Acacia*, *albizzia* and *xylia*- used for construction and fuel
- *Acacia nilotica*--gum tree- arabic gum, leaves of this plant are used as blood purifier
- *Acacia catechu*- A.senegal katha (a dye)
- *Prosopis glandulosa*- for breaking wind pressure
- *Mimosa pudica*- touch me not- chhui mui
- Efficiency of aerobic respiration= 40%
- In aerobic respiration--> 36atp
- Anaerobic---> 2 atp
- Energy yield is 18 times greater in aerobic than anaerobic
- Glycolysis- cytosol
- Krebs cycle- mitochondrial matrix
- Electron transport chain- inner membrane of mitochondria
- Stearic= C18
- Oleic= C18 with 1 double bond
- Phosphatidylcholine= lecithin
- Isoprenoid C5H8
- F. Sanger= discovered sequence of aminoacid in a protein molecule
- Insulin= 2 polypeptides. Total amino acids 51, one has 21 the other 30
- Hemoglobin= 4 chains 2 alpha(each has 141 aminoacids) 2 beta(each has 146 aminoacids)

- Alpha helix= 3.6 aminoacids in each turn
- Fibrous protein= sec structure
- Globular protein= ter structure
- Dna = one OH removed at C 2
- Most cell secretions are glycoprotein in nature
- Communities are dynamic collection of organisms
- Biomes are primarily determined by climate
- A phyletic lineage is an unbroken series of species arranged in ancestor to descendant sequence with each later species having evolved from one that immediately preceded it
- Science- systematized knowledge
- Scientific law- irrefutable theory
- Biological control- control by some living organism
- Hydroponic- used to determine whether a certain nutrient is essential for plant or not
- Cowpox pus= vacca (first developed vaccine)
- Combating disease utilizing all methods as and when required and ensuring a participation of community in this programme is known as integrated disease management
- Algae reduce pollution of heavy metals by bioabsorption
- Anabolic= simple to complex , requires energy
- Catabolic= complex to simple, releases energy
- C-H= potential source of energy for chem reactions
- C-O= in carbs provides stability to complex carbs
- Human tissues= 20% water
- Brain cells= 85% water
- All reactions occur in aqueous media
- Specific heat of vaporization of water= 574Kcal/kg
- Saccharon= sugar
- Tetroses are rare in nature and occur in some bacteria
- In blood= 0.08% glucose
- 10g glucose requires 717.6 kcal of solar energy
- Starch= blue colour with iodine
- Glycogen= red colour with iodine
- Cellulose= no colour with iodine
- Triglyceride= neutral lipid
- Fatty acids contain even no of C atoms= 2-30
- Max= 6 double bonds in fatty acid
- Animals= straight chain fatty acid
- Plants= maybe branched or ringed
- Palmitic= C16
- **Animalia**
- Microscopic parazoan
- Balanoptera 40m and 160000kg
- Animals arisen from volvox like protocist
- Multicellular - metazoa
- Unicellular- protozoa
- 33 phyla 9 major
- Blastopore present in gastrula stage
- Enteron one opening
- Gut two openings
- Cnidarians diploblastic
- Rest all are triploblastic
- Porifera no layers
- Cnidaria radially symmetrical
- Rest all bilaterally
- Echinoderms young bilateral adults radial

- Acoelomata platyhelminthes
- Pseudocoelomata nematodes
- Rest are coelomata
- Coelom formed by splitting of mesodermal layer
- Annelida arthropoda mollusca protostomes
- Echinodermata chordata deuterostomes
- Porifera
- 5000 species
- Pinacocytes - epidermis
- Porocyte- pores
- Choanocytes- flagellated cells
- Spicules- skeleton
- Amoebocytes- pigments presence
- Larva- amphiblastula
- Asexual repro by gemmule
- layers present diploblastic -cnidarian
- layers triploblastic rest of the kingdom
- symmetry is overall shape no symmetry means asymmetrical-sponges radial symmetry - body can be divided into identical halves by any plane ex: cnidaria and echinoderm bilateral symmetrical- animal cut into right or left half by mid line
- Acoelomata : platyhelminthes
- Pseudocoelomata : nematodes
- Coelomata : from annelida to chordata
- blastopore develops into embryo and either form mouth or anus at the end
- proto=first protostomata blastopore forms mouth eg annelida, mollusca, arthropoda
- deutro=second stoma=mouth deuterostomata blastopore forms anus eg echinodermata and chordata
- Porifera
- 5000 species, simplest animals, pores called ostia lack mouth, intestine, respiratory and dig, excretory and nervous sys Diffusion of gases and food assemblage of loosely organized cell-sponge pinnaocytes epidermis porocytes pores choanocytes endodermis ascon type -spongocoel single cavity sycon -2 cavities leucon-more than 2 cavities sponges look coloured due to presence of pigments in amoebocytes or due to symbiotic algae spicules maybe calcareous or siliceous 10 cm sponges filter 20 litre water everyday amphiblastula larva asexual reproduction by spore like gemmule formation
- Skeleton basis class eg sycon calcareous, euplectella hexactinellada. euspongia from demospongia
- Cnidaria
- 9000 species
- Radial symmetry
- Diploblastic
- Carnivores
- Stinging cells cnidocytes
- Tissue grade organization
- 2 body forms polyp and medusa
- Polyp sessile, asexual
- Medusa motile, sexual
- Larva planula
- Red coral Marjan
- Platyhelminthes
- 15000 species
- Soft bodied
- Flat ribbon shaped Acoelomate
- Bilateral symmetry
- Triploblastic
- Either monogenic or digenic
- Nematelminthes

- 20000 species
- Bilateral symmetry
- Triploblastic
- Pseudocoelomate
- Round worms with pointed ends Annelida
- 15000 species
- Segmented worms
- Metamerically segmented
- Triploblastic
- Bilateral symmetry
- Coelomate
- Setae with or without parapodia for locomotion
- Closed type circulatory system with many pulsatile hearts
- Larva trochophore
- Hirudin- prevents blood clotting
- Earthworm - farmers friend
- Mollusca
- 50000 species living 35000 fossil= 85000
- Largest after arthropoda
- Squid largest invertebrate
- Triploblastic
- Coelomate
- Bilateral symmetry
- Larva trochophore
- Gastropoda largest class
- Bivalvia second largest
- Cephalopods all marine
- Pearl is formed when any substance comes in between mantle and shell
- Arthropoda
- Largest phylum
- One million species
- Bilateral symmetry
- Triploblastic
- Metamerically segmented
- Coelom is haemocoel
- Exoskeleton- chitin
- Farming of bees- apiculture
- Farming of silkworm- sericulture
- King Crab living fossil
- Silk is a protein
- Crustacea most economic class
- Sacculina is a parasite
- Insecta- largest class of animal kingdom
- Study of insects- entomology
- Rat fleas are involved in transmission of Plague
- Silver fish bookshelves
- Echinodermata spiny skinned 6000 species
- Bilateral symmetry in larvae
- Adults radial
- Coelomates
- Deuterostome
- Pentaradial
- Triploblastic
- Calcareous plates skeleton

- Water vascular system
- Madreporite- water storage takes place
- Larva bipinnaria
- Echinoderms evolved as a side branch from common dipleura which also gave rise to hemichordates and chordates
- Hemichordata half notochord
- 90 species
- Bilateral symmetry
- Balanoglossus gigas 1.5m
- Open circulatory system
- Larva- tornaria
- Chordata
- 45000 species
- Bilateral symmetry
- Triploblastic
- Deuterostome
- Coelomate
- Organs are suspended by thin membranous tissue called mesentery
- Acraniata divided into
- Urochordates- tunicates (notochord in tail), retrogressive metamorphosis
- Cephalochordata (notochord from head to tail), branchiostoma also called amphioxus
- Craniata or vertebrata divided into
- Agnatha (no jaws) commonly called cyclostomes
- Gnathostomata (with jaws) divided into pisces and tetrapoda
- Pisces
- 25000 species
- Largest group of chordate
- Study is called ichthyology
- Streamlined body
- Chondrichthyes cartilaginous, also called Elasmobranchi, placoid scales, mouth ventral, tail heterocercal, 5 exposed gills
- Osteichthyes bony, teleostomi, largest class, mouth anterior, cycloid or ctenoid scales, air bladder present, tail homocercal or diphyocercal. Also include lung fishes belonging to order dipnoi
- Flatworms exhibit beginning of cephalization
- Tetrapoda
- Pentadactyl limbs
- Amphibia
- 2000 species
- Double life
- Cold blooded
- Winter hibernation
- Summer aestivation
- Amphibians arose from Rhipidistian (lobe finned fish)
- Coelocanth relative of rhipidistian a living fossil
- External fertilization
- Reptilia
- Cold blooded
- 5000 species
- Amniota
- Internal fertilization
- Oviparous
- Sphenodon a living fossil
- Birds
- Ornithology

- 9000 species
- Warm blooded
- Pneumatic(hollow) bones
- Spindle shaped body
- Syrinx sound producing organ
- Internal fertilization
- Oviparous
- Amniota
- Ratitae flightless birds
- Carinatae flying birds
- Thecodont gave rise to dinosaurs and birds too
- Only one ovary
- Mammalia
- 4500 species
- Hair and mammary glands present
- Internal fertilization
- Ovi and viviparous
- Arose from Therapsida
- Prototheria egg laying also called monotremes, 3 species
- Metatheria pouched mammals, 250 species
- Also called marsupials
- Premature baby
- Eutheria placental mammals
- 95% of mammals
- Ungulates hooved mammals
- Primates include man monkey gorilla apes lemurs
- Bats only flying mammal
- Largest terrestrial elephant
- Largest marine whale
- Markhor national animal
- Houbara bustard national bird
- PHYLUM NEMATHELMINTHES -ASCHELMINTHES -round worm
- 20,000 species, each rotting apple may contain 90000 species, bilaterally symmetrical, triploblastic, live as scavengers, predators and parasites on animals and even on plants.
- Ascaris-live in the intestine of man, sexually dimorphic male smaller than female, female ascaris produce 200000 eggs per day thread like worm
- Wuchereria transmitted by mosquito attack the lymphatic vessels of animals and man cause a disease filiriasis causing inflammation of arms,legs,scrotums and this condition is called elephantiasis
- Ancylostomata a hook worm whose larva can penetrate through skin and reach the intestine where it matures and suck blood
- PHYLUM ANNELIDA SEGMENTED WORMS
- most complex worms distinguished by their rings annules
- 15000 species bilaterally symmetrical triploblastic coelomates close circulatory sys definite blood vessels many pulsatile hearts active free swimming predators and filter feeders trocophore larva
- Polychaeta eg sabella peacock worm clam worm neries oligochaeta eg earthworm pheretima
- Hirudnea eg leech substance in leech called hirudin prevents blood from clotting used in ploughing fields , fish bait, medicine sucking foul blood
- **PHYLUM MOLLUSCA**
- 50000 alive 35000 fossils squid 18m long 1800kg triploblastic coelomate bilaterally symmetrical open circulatory sys the major component of hydrostatic skeleton trocophore larva segmented worms and molluscs are related Gastropoda - largest class eg pila fresh water and terrestrial asymmetrical by twisting of visceral mass at 180 phenomenon called torsion Class bivalvia- shell with 2 halves second largest class marine and fresh water eg unio mytilus and pearl oyster Class cephalopoda foot on the head all marine foot transformed into

suckers bearing tentacles and arms eg nautilus outer shell sepia cuttle fish inner shell devil fish octopus no shell
loliigo squid- largest invertebrate -inner shell

- shells are made of inner lusturous layer of calcium carbonate and proteins called nacre or the mother of pearl.
- **PHYLUM ARTROPODA**
- largest phylum 1million species bilaterally symmetrical triploblastic metamerically segmented coelom is called haemocoel
- open type circulatory sys Respiration by gills in fish by trachea in insects by book lungs in scorpion compound eyes with mosaic vision metamorphosis heterophrodite complete metamorphosis butterfly incomplete grasshopper and cockroach Jointed appendages for swimming running
- flying
- food capture copulation sensory perceptions attachment of muscles exoskeleton water proof made up of chitin
- Undergo moulting and ecdysis
- Nematodes have largest number of species but the largest phylum is arthropoda
- 80% arthropods and 90% arthropods are insects humans transmit plasmodium trypanosoma and germs of cholera apiculture farming pf honey bee sericulture farming of silk worm
- **CLASS MEROSTOMATA**
- King crab limulus considered as living fossil mouth covered with plates CLASS ARACHNIDA
- four pairs of legs respire by book lungs, trachea and body surface eg scorpion largest no of species spider- possess silk gland which secrete protein which on exposure to air become silk thread
- CLASS CRUSTACEA prawns shrimps lobsters and crabs marine fresh water and terrestrial cephalothorax head and thorax fused covered by exoskeleton carapace Five pairs of legs eg sacculina are parasite daphnia and cyclops fresh water microscopic
- MYRIAPODA many legs lead a hidden life
- Centipede one pair appendages per segment
- Millipede 2 pairs appendages per segment
- INSECTA OR HEXAPODA
- largest class study of insects called entomology
- With wings pterygota
- Without wings apterygota
- Modes of feedings
- biting and chewing cockroach piercing and sucking mosquito chewing and lapping honey bee sponging type house fly siphoning type butterfly social insects eg ants honey bees and termites flies and mosquito cause cholera , dysentary and malaria rat fleas cause deadly plague fleas are ectoparasite on warm blooded animals pests of plants grasshopper moths butter flies and beetles cockroaches damp places silver fish in book shelves tolerate 65'C and found in oil wells
- PHYLUM ECHINODERMATA
- 6000 species bilaterally symmetrical larva radially symmetrical adult lives always in sea pentaradial (pentamerous) possess spines tube feet perforated exoskeleton unique water vascular sys mostly sexual reproduction sometimes asexual
- Bipinnaria larva
- Eg star fish
- brittle star sea cucumber sea urchin bipinnaria larva resemble tornaria larva
-
- **HEMICHORDATA**
- 90 species half notochord live in burrows solitary or colonial few mm to 250 cm in length Balangossus gigas length 1.5 m no sexual dimorphism
- **PHYLUM CHORDATA**
- forms notochord
- 45000 species -Notochord
- found in early stage of all chordates but disappear in some at adult stage and transform into vertebral column
- -Hollow dorsal tubular nerve cord
- fluid filled in craniata it differentiate into brain and spinal cord
- -pharyngeal gill slits in early stages and disappear in adult in terrestrial whereas in quatic transform into gills
- -Acraniata or protochordata no brain box notochord doesn't form vertebral column
- -urochordata

- body enclosed in tunic called tunicates eg ascidia, herdmania -cephalochordata notochord from head to tail small group includes bronchiostomata also called amphioxus
- -Craniata or vertebrata carnum and vertebral column present sub classes
- Agnatha - also called cyclostomes mouth without jaws jawless fishes parasites eg hag fish and lamprey Gnathostomata - mouth with jaws super class pisces
- Pisces 25000 species study of fishes ichthyology
- Chondrichthyes cartilagenous fishes placoid scales form exoskeleton tail heterocercal sharks, skates and rays torpedo shark producing ray scoliodon also called dog fish Osteichthyes- also called teleostomi bony fishes cycloid or ctenoid exoskeleton tail is homocercal or diphyrcercal eg eel , sea horse, flying fish and globe fish
- Lung fishes of order dipnoi -only 3 genera
- Class amphibia 2000 species double mode of life lack exoskeleton respire by lungs, skin, gills and lining of buccal cavity lay eggs in water hibernation in winter aestivation in summer caecilians, lizard , frogs and toads toads have warty skin rhipidistans were the ancestors of amphibians coelocanth are living fossil
- Reptilia 5000 species terrestrial crawl lay eggs on land covered by leathery shells amnion present poikilotherms two pairs of limbs pentadactylous snakes have no limbs no eyelids no ears Dinosaurs means terrible lizards egg permeable to gases Sphenodon living fossil eg snakes lizards turtles tortoise crocodiles and alligators
- Green turtle chelone mydas
- Fangs produce venom which is haemotoxic or neurotoxic green turtle lays eggs on same land it was born
- BIRDS 9000 species study of birds ornithology defined as feather covered bipedal flying vertebrate possessing wings sound box called syrinx toothless beak internal fertilisation eggs are large amniotic hard and calcareous
- Ratitae flightless birds running birds wings vestigial or rudimentary sternum without keel eg ostrich kiwi penguin
- Carinatae flying birds sternum with keel eg hoopoes, fowls sea gulls terns and cranes are migratory birds Peacock and houbara most beautiful birds are often called glorified reptiles Thecodont gave rise to dinosaurs and birds birds are feathery dinosaurs
- **MAMMALIA**
- 4500 species distinguishing characteristics hair and mammary glands and muscular partition the diaphragm internal fertilisation origin from therapsida
- -Prototheria
- egg laying mammals echinida , duck billed platypus spiny ant eater, are connecting link btw reptiles and mammals
- -Metatheria
- Order marsupilia Viviparous pouch is called marsupium Pouched mammals eg kangaroo koala bear and opossum
- -Eutheria placental mammals
- 95% mammals
- viviparous
- Ungulates hoofed mammals Bear is omnivore intelligent group lemurs monkey gorilla apes and man bats flying mammal
- Blind dolphin aquatic mammal pakistan has
- 174 species mammals
- 670 birds
- 177 reptiles
- 22 amphibians
- 788 fishes
- 1182 invertebrates
- 500 insects
- PHYLUM CNIDARIA also called coelenterata
- 9000 species, least complex metazoa, eg hydra,jelly fish, sea anemone radially symmetrical and diploblastic coelenteron serves as rudimentary gut
- Diffusion of gases and food Carnivores have special stinging cells called cnidocytes
- Two types of body
- Polyp- mouth and tentacles at upper end eg hydra, sea anemone and corals medusa- umbrella shaped mouth and tentacles at lower side eg jelly fish

- Planula larva
- Alternation of generation
- Polymorphism -occurrence in different forms or zooids eg physalia dactylozoid defense gonozooids gonads gastrozooids dig coral reefs are under water lime stone ridges, restricted to warm water Red coral marjan is used in medicine by hakims
- PHYLUM PLATYHELMINTHES
- 15000 species, flat or ribbon shaped worms, most simple among the animals having head, rudimentary nervous sys, bilaterally symmetrical, acoelomate, triploblastic with organs and organ sys, hermaphrodite, complete their cycle in host monogenic if 1 host involved digenic if 2 host involved Classes eg: Trematoda -Fasciola -liver fluke ,
- Turbalaria-Dugesia-planaria , Cestoda-taenia saginata-tape worm
- **BIOENERGETICS**
- *1 photon of light excites one electron.
- *The oxygen we breathe is the product of PS2
- *Process of generation of ATP both in chloroplast and mitochondria is chemiosmosis.
- *There is net gain of 19ATP from one molecule of glycerol
- *In krebs cycle for every one molecule of glucose broken down two Acetyl-CoA molecules are formed
- *In glycolysis two molecules of NADPH and two molecules of ATP are produced
- *Inability of oxidative metabolism of the reduced products i.e lactic acid causes a condition called oxygen debt. its during extreme fatigue conditions. this debt ends when the metabolism that produces reduced products i.e lactic acid slows down. (courtesy by Book glossary given at the end)
- Cytochrome = any of the iron containing protein that acts as a carries in ETC.so according to this defination Ferridoxin (iron containing protein) can also be called Cytochrome.(courtesy by book glossary given at the end)
- *Oxidation of one molecule of glucose gives = 36 ATPin which 34 Atp are produced in ETC while 2 in
- Cytoplasm.
- *Glycolysis = 2atp used , 4made, 2 net gain*krebs cycle = 2 atp made
- ETC = 34 atp made
- *Total in aerobic respiration = 36/38 agr Q men dono options hon then 36 ko prefer krna hy.
- *Total in cellular respiration = 38/40 Agr Q men dono options hon then 38 ko prefer krna hy.
- *****Glycolysis*****
- 2NADH₂ or FADH₂ are formed.2Atps are realeased.
- ***Formtion of Acetyl CoA.***
- 2NADH₂ or FADH₂ are formed.No atp is released.
- ***Krebs cycle***
- 6NADH₂+2FADH₂and 2atps are released
- ***Electron transport chain***
- Total NADH₂ = 10 (Each NADH₂ molecule gives 3 atps)Total FADH₂ = 2 (Each FADH₂ gives 2 Atp)so no of atps 30+4 = 34
- ***Total 38 possible atp molecules are formed during breakdown of one glucose molecule. But practically 36 molecules are formed. The glycolysis produces NADH₂ in cytosol. 2 atp molecules are used for bringing these NADH₂ to mitochondria. So 38-2 = 36Atp
- Copied from Sir Asad's post.
- Atp---> Adp + pi= 7.3kcal or 31kj
- Endergonic= energy gaining
- Exergonic= energy releasing
- Photosynthesis= anabolic
- Respiration= catabolic
- Carotene orange
- Phaelophytin grey
- Xanthophyll yellow
- Chlorophyll a blue green
- B yellow green
- Chl a C₅₅H₇₂O₅N₄Mg

- Chl b C55H70O6N4Mg
- Carotene absorbs green blue violet wavelength and reflects red yellow orange Light reac thylakoid membrane
- Light independent reac stroma
- Ps1 electron acceptor ferredoxin and electron donor plastocyanin
- Ps2 electron acceptor phaeophytin and intermediate donor water splitting complex
- Ps 1 and Atp synthase in non appressed
- Ps 2 in appressed alongwith lhc 2 (light harvesting complex)
- Light reaction starts from ps2
- Non cyclic ATP and Nadh2 both produced
- Cyclic only Atp
- Cyclic only involves Ps1
- Dark reaction calvin benson cycle C3 cycle
- 13 reactions 11 enzymes
- Regeneration of RuBP involves enzyme 5-11
- C4- sugar cane corn grass family
- Light reaction cycles req for production of glucose in dark cycle
- 6 light reactions
- Cam - cacti pineapples
- Oxidation of glucose= 673Kcal or 2823kj
- Fermentation louis pasteur
- Net gain of glycolysis 2Atp and 2nadh
- Flavour of pickle- lactic and acetic acid
- Krebs cycle citric acid cycle tricarboxylic acid cycle
- Glycolysis occurs in cytoplasm
- Krebs occur in mitochondria
- And overall net gain including glycolysis and etc 36 atp (check)
- Net gain of kreb cycle 30 atp
- Sun ----> producers
- 0.2%
- Producers----> primary consumers----> sec consumers----> ter consumers
- 5-20%
- Energy coming from sun
- 40% reflected back
- 15% absorbed by ozone
- 45% to earth out of which 2-3% is used by plants
- Energy transfer^
- Plastocyanin- copper containing protein
- Plastoquinone- associated with ferrous ion
- As e goes down the chain , energy is lost and used for synthesis of ATP
- Ferredoxin- iron containing protein
- The path of e through 2 photosystems during non cyclic photophosphorylation is known as Z-scheme
- When Atp conc low- cyclic phosphorylation
- In both cyclic and non cyclic- production of Atp- chemiosmosis
- Calvin- nobel prize 1961
- Rubisco- most abundant protein in chloroplast and most abundant protein on Earth
- ""Cellulose- most abundant carbohydrate in nature- HEC PHASE 2 QUES""
- Starch - second most abundant carb in nature
- G3P- formed in both cellular respiration and photosynthesis(dark reaction)
- C3H4O3- Pyruvic acid
- C3H6O3- Lactic acid
- Glycolysis- splitting of sugar
- The second and third phosphate are high energy bonds in ATP
- Oxygen- not essential for glycolysis
- The oxidation of phospho-glyceraldehyde (PGAL) is energy yielding process

- Acetyl CoA- active acetate
- Acetyl- 2C
- Citrate- 6C
- Oxaloacetate- 4C
- Fumerate- 4C
- Alpha ketogluterate- 5C
- Succinate- 4C
- Malate- 4C
- FAD(coenzyme)- oxidizing agent which is reduced to FADH₂
- Etc-
- Co enzyme Q--> Cyt a --> cyt c--> cyt a--> cyt a₃
- Nadh is oxidized by coenzyme Q
- Oxygen is the final acceptor of electrons in Etc and production of water takes place.
- Bioenergetics- study of quantitative study of energy relationships and conversions in biological system
- Atp- chemical link between catabolism and anabolism
- Photosynthesis- energy capturing
- Respiration- energy releasing
- Solar energy --> food energy--> chemical energy
- Purple sulphur bacteria- bacterio-chlorophyll and carotenoids
- Green sulphur- chlorobium chlorophyll
- NPK- 5,10,5
- Nitrogen def
- Chlorosis
- Development of anthocyanin pigments
- Early senescence
- Phosphorous
- Helps in translocation of carbs
- Fruit ripening
- Def
- Necrotic patches
- Cambial activity is checked
- Potassium
- Stomatal opening
- Found in highest conc in meristematic cells
- Activator for enzymes
- Def
- Colour of leaves dull or bluish green
- Irregular chlorosis
- Magnesium
- Phosphorous carrier in plant
- Synthesis of fats and metabolism of carbs and phosphorous
- Def
- Chlorosis
- Necrotic spots
- Silica-- grass
- Cobalt- nitrogen fixing bacteria
- Nickle- soyabean
- Sodium- osmotic and ionic balance

NUTRITION

- Parasitic plants-- haustoria
- Partial stem- Loranthus, Viscum, Cassytha filiformis
- Total stem- Cuscuta
- Partial root- Sandalwood
- Total stem- Orobancha, Cistanche, Striga

- Neotia(birds nest or orchid) and Monotropa(indian pipe)- saprophytic plants
- Partially autotrophic and partially heterotrophic plants are carnivorous
- Dionea muscipula- Charles Darwin called it the most wonderful plant
- Sac like- enteron- one opening
- Tube like- gut- two openings
- Daphnia- filter feeder
- Mytilus- common mussel
- Assimilation- ultimate goal of nutrition
- Alimentary canal- 9m long
- Gastric juice secreted by gastric mucosa
- Erepsin- protein to aminoacids
- Microvilli take in food by pinocytosis
- Hydra- macrophagous- have glandular cells(for secretion of enzymes) and musco-elithelial cells(contraction of body wall which helps in circulation of food)- sac like - extra and intracellular digestion
- Planaria- carnivorous- sac type- branched intestine increasing the surface area for digestion, absorption and distribution of food- extra and intracellular digestion
- Cockroach- omnivorous- tubular- extracellular digestion- hepatic caeca lined by glandular cells Human digestive system- gastro intestinal tract
- Gall bladder- cystic duct
- Lower jaw is movably attached
- Two sets of teeth- diphyodont
- Embedded in gums- thecodont
- Diff shapes and sizes- heterodont
- Molars have no deciduous predecessors
- Plaque- mixture of bacteria and salivary materials
- Plaque+ chemicals in saliva- become calcified forming calculus
- 3 pairs of salivary glands - 1.5dm³ of saliva
- Oesophagus- 25 cm
- Cardiac and pyloric region of stomach- mucous glands
- Zymogen cells- Pepsin
- Oxyntic cells- HCl
- Layers of stomach
- Logitudinal muscle layer
- Circular muscle layer
- Oblique muscle layer
- Serosa
- Gastrin is produced by stomach in the presence of partially digested protein
- Mixing waves move along the stomach- 20 sec
- Small intestine- 6m
- Duodenum- 30 cm
- Bile - yellow in colour turns green on exposure to air
- Secretin is produced by duodenum under the stimulus of HCl present with chyme
- Digestion of fat is completed in duodenum
- Jejunum- 2.4m
- Digestion of food is completed within the jejunum
- Ileum- 3.6m
- Receives food in solution form
- Stored food is delivered to liver by hepatic portal vein
- Active transport is employed in the absorption of digested food
- Large intestine- 1.5m
- Appendix- 18cm
- Symbiotic bacteria present in large intestine synthesize vit K
- Liver is the largest gland

- Skin largest organ
- Liver processes fatty acids and stores them as ketone bodies which are later released as nutrients for active muscles
- Faeces- dead bacteria, cellulose, other plant fibres, dead mucosal cells, mucus, cholesterol, bile pigment derivatives and water
- Dysentery- caused by bacillary and amoebic infection
- Piles- haemorrhoids, external piles- covered by skin and internal piles - lie beneath the anal mucous membrane
- Food poisoning- gastro enteritis
- Salmonella common cause of food poisoning
- Extreme protein deficiency- kwashiorkor disease resulting in edema
- Anorexia nervosa- loss of appetite (young girls usually after puberty)
- Bulimia nervosa- (women) eating binges
- Successful parasite- live in host without causing harm
- Taeniasis- taenia saginata
- Enterobius vermicularis- itching around anus
- Facilitated diffusion- carrier proteins, forms a water filled pore in the membrane

CHAPTER 13 RESPIRATION

- Source of oxygen- respiratory media
- Air - 21% oxygen
- Water- 5% oxygen
- Guard cells have chloroplast
- Photorespiration occurs in wheat rice sugarcane
- Organelles involved in photorespiration are mitochondria, chloroplast and peroxisome
- Serine is an amino acid
- Cockroach - tracheal system , 10 pairs of spiracles (2 in thoracic and 8 in abdomen), spiracles are operated by valves
- Gill contains two rows of hundreds of filaments
- Counter current flow enables 80-90% uptake of oxygen
- Frog uses negative pressure breathing, it has incomplete ventilation
- Birds have membranous channels parabronchi , complete ventilation , takes two breaths to move air completely
- Frog positive pressure
- Lungs
- Right lung divided in 3 lobes
- Left in two lobes
- Left contains cardiac notch
- Right weighs 700g
- Left weighs 625g
- Lungs are enclosed by pleural membrane
- Alveolus has a slightly larger diameter than capillaries
- Surfactant reduces internal surface tension
- Both lungs contain about 700 million alveoli
- Man uses negative pressure breathing
- Inhalation - active process
- Exhalation- passive process
- Inspiration
- External intercostal muscles contract
- Diaphragm contracts and becomes flat
- Internal intercostal muscles relax
- Expiration
- External intercostal muscles relax
- Internal intercostal contract
- Diaphragm relaxes and becomes dome shaped
- Lung cancer- loss of cilia of epithelial cells
- Emphysema- alveoli deteriorate

- Blood takes in oxygen more rapidly than water
- Rate of breathing is monitored by
- Aortic and carotid bodies and medulla oblongata
- Total lung capacity- 5 litre
- Tidal- 0.5litre
- Vital- 4 litre
- Residual- 1 litre
- Myoglobin binds more tightly to oxygen than haemoglobin
- Co₂ transport
- 35% by haemoglobin
- 60% by water of rbc (K)
- 5% by water of plasma (Na)
- Enzyme- carbonic anhydrase

CHAPTER14 TRANSPORT

- Phloem loading- active transport
- Starch, gum, cellulose, protoplasm, proteins- great affinity for water, hydrophilic
- 1MPa= 9.87 atm
- Values of water potential are negative
- Water potential= solute potential + pressure potential
- Cell to cell- cellular pathway
- Plasmodesmata- symplast
- Extra cellular pathway- apoplast
- Xylem and phloem- complex tissues
- Rate of flow of water vessels is 10 times that of tracheids
- Ascent of sap- 15m/hr
- Root pressure- stephen haes 1727
- Root pressure causes guttation
- Adhesion- molecules to water
- Cohesion- molecules together
- Ascent of sap- solar powered
- Guard cells have chloroplast
- Sucrose- synthesized in cytosol of mesophyll cells
- Phloem loading- short distance
- Phloem unloading- long distance
- Water movement in translocation- by pressure gradient
- Open type circulatory system- Arthropods, Molluscs and Tunicates
- Cockroach- dorsal vessel - forward
- Earthworm- dorsal - forward - ventral- backward
- Pyrogens are released by WBC, lymphocytes, infected cells, infecting agents
- In reptiles, crocodile has 4 chambered heart
- Blood - connective tissue
- Red corpuscles- biconcave
- Granulocytes 72%- neutrophils(70%), eosinophils(1.5%), and basophils(0.5%)
- Agranulocytes(28%)- monocytes(4%) , lymphocytes(24%)
- Neutrophils and monocytes- phagocytic
- Lymphocytes, eosinophils , basophils produce antitoxin, histamine and heparin
- Haemopoietic- give rise to blood vessels
- Thalassemia- hypochromic anaemia(blood cells are paler than normal), enlargement of kidney
- Left ventricle has more muscular walls
- Heart muscles are myogenic- contract without external stimulation
- Resting phase- Diastole
- Contracting phase- Systole
- The volume of blood pumped per minute by left ventricle into the systemic circuit is called cardiac output
- Ventricular systole- LUB

- Ventricular diastole- DUP
- One complete heart beat lasts for about 0.8 seconds
- Heart murmur- defect in valves
- SA node- close to the point of entry of superior vena cava, it is a vestige of sinus venosus
- Delay of about 0.15 sec from conduction of impulse to AV node from SA node
- Blue babies- cyanosis
- Blood pressure is determined partly by cardiac output and partly by diameter of arterioles
- Largest lymph vessel- thoracic duct
- Lymph- means of exchange between blood and body cells
- Accumulation of lymph- edema
- Hypertension- silent killer
- Paralysis of one side of the body- hemiplegia
- Escape of blood from vessel walls- haemorrhage
- Massive accumulation of blood within a tissue- haematoma
- Monocyte develop into macrophages

Basophils and mast cells release- histamine

BIO 2

HOMEODTASIS

- Neurospora- pink bread mold
- Hagfish- isotonic
- Rectal glands- salt excreting glands
- Marine animals retain trimethylamine oxide in their bodies for protection against urea
- Kangaroo rat survives without drinking water by feeding on seeds of desert plants containing more carbs which produce water of metabolism
- Terrestrial animals can tolerate dehydration, known as anhydrobiosis
- The falling of yellow leaves in autumn is seasonal time for plants to get rid of accumulated wastes, for this reason leaves are called excretophores
- Creatine or trimethylamine oxide
- 500ml water- 1g NH_3 , ammonotelic
- 50ml water- 1g urea, uricotelic
- 1ml water- 1g uric acid, uricotelic
- Cockroach- excretory system associated with digestive system
- Source of wastes:
- Urea- metabolism of amino acids
- Creatinine- muscle creatine
- Uric acid- from nucleic acid
- Sweat- sweat glands
- Sebum(protection against microorganism)- sebaceous gland
- Kidneys receive 20% of blood with each cardiac beat
- Filtrate in Bowman's capsule- glomerular filtrate which contains glucose aminoacids etc.
- Renal failure- high blood pressure , anaemia
- High degree renal failure- uremia
- Plumage in birds- physiological adaptation
- Sweat glands, fat layer- structural adaptation
- Marine animals have a very thick layer of fat called "blubber" under their skin
- Panting- evaporative cooling in respiratory tract in dogs
- Bats use saliva and urine for evaporative cooling

SUPPORT AND MOVEMENT

- Collenchymatous cells- support to baby plants
- Sclerenchymatous cells- adult plants
- Collenchyma- heavily lignified cells in cortex, have angular thickening in pri wall Sclerenchyma- heavily lignified cells in xylem tissues

- Turgor pressure generated by high osmotic pressure of cell vacuole
- Fibres- tracheids
- Vessels- tracheae
- Sec xylem- increase in stem thickness
- Active portion of xylem- sap wood
- Nonconducting portion- heart wood, provide a resistance to decay and insect attack (red cedars, conifers)
- Commercial cork- Quercus suber
- Autonomic - internal
- Paratonic- external
- Cyclosis- passive movement [
- Pulvinus-is swollen portion of petiole, place of attachment of leaf with the shoot
- Mimosa- 10min to regain turgor
- Epinasty, hyponasty- leaves, petals
- Auxin inhibit growth of root cells and stimulate growth of stem cells
- Epinasty- auxin
- Hyponasty- gibberellin
- Contraction of circular muscles- elongate
- Contraction of longitudinal muscles- shorten
- Cuticle- outermost layer is epicuticle, below it is procuticle which contains bulk of exoskeleton
- Molluscan shell can grow
- Exoskeleton contains sensory receptors called sensilla
- Ecdysis is controlled by hormone ecdysone
- Bone a store for Ca, P, Na and K
- Bone marrow- connective tissue
- Bone- most rigid form of connective tissue
- Bone forming cells- osteoblast
- Mature bone cells- osteocyte
- Bone dissolving cells- osteoclast
- As bones grow osteoblast are trapped within
- Hyaline cartilage- movable joint
- Elastic cartilage- pinna of ear and epiglottis
- Vertebral column has 4 curvatures
- Chest cavity- semi vacuum chamber
- Radius and ulna at distal end form multistage joint
- Osteomalacia- soft bones
- Annulus fibrosus holds successive vertebra
- Healing time of fracture- 8-12 weeks
- Fibroblast and osteoblast construct bone after fracture
- Ligament- bone to bone
- Tendon- bone to muscle
- Hele - bright
- Zwischen- between
- Troponin is a three polypeptide complex
- Rigor mortis- after death- atp conc falls- bonds b/w actin and myosin cant be broken- body becomes stiff
- Complete immobilization of muscles- atrophy
- Cockroach- flight by posterior pair of wings
- The second cervical vertebra(axis) is modified in reptiles for rotational movement
- Birds passive flight- gliding- wings act as aerofils
- Active flight- flapping its wings
- Plants grown without light become long and fail to form chlorophyll- etiolated
- Galls are growths on plants induced by parasites
- **RESPONSE AND CO-ORDINATION**
- Gibberellin substitute for red light
- Ethene stimulates ripening of tomatoes and citrus fruits

- Pain receptors are 27 times more abundant than cold receptors
- Cold receptors are 10 times more than heat receptors
- $3\text{ Na}^+ : 2\text{ K}^+$
- In myelinated neurons impulse jumps from node to node (node of Ranvier) called as saltatory impulse
- Speed of nerve impulse - min 100m/s- max 120m/s

- Cerebellum is best developed in birds
- Gray matter- non myelinated neurons
- White matter- myelinated neurons
- Ganglia are conc of cell bodies of neuron
- Alzheimer- caused by high levels of aluminium
- Nicotine affects post synaptic membrane
- 20 endocrine glands
- LH called as ICSH in males
- Calcitonin is antagonistic to parathormone
- Cortisol- glucocorticoid
- Corticosterone- glucocorticoid and mineralocorticoid
- Aldosterone- mineralocorticoid
- Gsstrin- mucosa of pyloric region
- Progesterone suppresses ovulation
- Insulin- has immediate effect
- Plant behaviour- innate
- Insight learning- Kohler, highest form of learning
- Habituation- simplest learning behaviour
- Sporogenesis- spore formation
- Diplohaplontic- alternate diploid sporophyte and haploid gametophyte
- Fruit development without fertilization- parthenocarpy, by auxin
- Auxin is necessary for fruit set- retention of ovary
- Pericarp- fruit wall
- Fruit ripening is often accompanied by a burst of respiratory activity called climacteric
- Photoperiodism- 1920 Garner and Allard
- Cocklebur - Xanthium henbane- Hyoscyamus niger
- Photomorphogenesis- light controlled development of form and structure
- P660----> P730 day
- P730----> P660 night

REPRODUCTION

- Photosynthesis- only during day
- Respiration- day and night
- At dawn and dusk when light intensity is low the rate of photosynthesis and respiration may equal one another, At this point there is no net exchange of gases between atmosphere and leaves, this point is called as compensation point
- Plants split water as a source of hydrogen - Van Niel
- NADPH₂ is the reducing power which alongwith ATP reduces CO₂ to glucose NADPH₂ provides electrons and Atp provides chem energy
- Each mesophyll cell- 20-100 chloroplasts
- Enzymes are present in stroma
- Visible light- 380-750 nm
- Spectrophotometer- measure relative abilities of diff pigments to absorb diff wavelengths of light
- Carotenes- red to orange
- Xanthophylls- yellow to orange
- Phytyl C₂₀H₃₉
- Chlorophyll a - most imp and abundant pigment
- Carotenoids protect chlorophyll from intense light

- These may also be present in our eyes
- Absorption is max at red and blue parts of spectrum , at 670nm and 430nm respectively
- When equal intensities of light are given there is more photosynthesis in red than in blue part of spectrum
- Stomatal opening is due to biological clock
- No of stomata is directly proportional to amount of gas diffusing in leaves
- Vernalization- 4°C temp most effective, vernalin hormone
- Egg without fertilization- parthenogenesis
- In male honey bees(drones) sperms are produced by mitosis
- Aphids- diploid parthenogenesis
- Cloning- subculturing
- Identical twins- asexually
- Fraternal- sexually
- ""Duckbill platypus and spiny ant eater are ovioviviparous""
- Sertoli cells - FSH and testosterone (if both not mentioned then best opt is FSH), provide liquid medium protection and nourishment to sperms.
- Second meiotic division in oocyte goes as far as metaphase but is not completed until oocyte is fertilized by sperm
- Fertilization- proximal part of oviduct
- Follicle breakdown process is called follicle atresia
- Organ formation begins- 12th week of pregnancy
- Avg blood loss during after birth bleeding- 350cm³
- Neisseria gonorrhea- gram positive
- **GROWTH AND DEVELOPMENT**
- Growth pattern in plant- open growth
- Intercalary meristem- imp role in production of leaves and flower
- Lateral meristems- cylinders of dividing cells
- Elongation- volume increases upto 150 fold by uptake of water
- Max growth- 25-30
- Min growth- 5-10
- Red light- elongation
- Blue light- division
- Indole 3 acetic acid- causes elongation
- Root primordia develop from root cambium called pericycle
- Auxin- apical dominance
- Cytokinin- lateral dominance
- Shell gland present in uterus
- The discoidal cap of cells above blastocoele- blastoderm
- Hensen's node- dorsal mesoderm
- Somites - 25-26 hr embryo
- Neurulation- 24 hours
- Gray crescent is pigment free area that appears at ths time of fertilization
- Cytoplasmic determinants- blastomeres
- Fertilized egg of ascidian- 5 diff colours in cytoplasm
- Acetabularia- multicellular alga
- Maintaining ideal weight can prolong life span by 11 years
- Avg human life span - 120-125 years
- In flatworms, planaria - neoblasts (unspecialized cells) differentiate into specialized cells when it is amputated from somewhere
- Environmental factors contributing to abnormal development- teratogens
- A typical chromosome contains about 1.4×10^8 nucleotides (140 million)
- Friedrich Miescher discvered nuclein (nucleic acid)
- Basic structure of nucleic acid- P A levene
- Phosphodiester bond- P-O-C

- The base pairs are apart as a result of hydrophobic interactions
- Primer- about 10 nucleotides
- Replication is always 5' - 3'
- Okazaki fragments 100-200 nucleotides in eukaryotes
- 1000-2000 nucleotides in prokaryotes
- Minimal medium- sugar amino acids salts few vitamins and water
- Sickle cell anaemia- Vernon Ingram 1956
- 1953- Friedrich Sanger - nucleotide sequence of insulin
- Template or antisense
- Coding or sense
- RNA polymerase. 1 - rRNA
- " " 2- mRNA
- " " 3- tRNA
- Mutations - raw material for evolution
- Point mutation- sickle cell anaemia and phenylketonuria
- Nerve cells and cells of lens do not divide
- Yeast cell - 90mins
- Length of chromosome- 0.25-0.5 micrometer during prophase
- Centromere- primary constriction
- Anaphase- most critical phase of mitosis
- Unwanted clone of cells- tumor
- Spread of tumor and establishment of sec areas of growth- metastasis
- Cancer cells- high nucleus to cytoplasm ratio
- Cancer results from accumulation of 3-20 mutations
- ""Interphase of meiosis lacks G2 stage""
- Down's syndrome
- Teenage mother - one in many thousands
- Forty years old- 1 in 100
- Forty five- 1 in 30 Honey bee 32 chromosomes
- Mouse 40 chromosomes
- Cell death also controls the number of neurons bcz most die during development
- Survival signals - trophic factors
- Apoptosis- dropping off or falling off
- Hydrogenation- Sabatier Sendern's reaction
- Hydrogenolysis- hydrogenation accompanied by bond cleavage
- **ECOSYSTEM**
Ecology- Ernest Haeckel 1869
- Eutary- river meets sea
- Ecosystem- Tansley 1935
- Light is in the form of radiant energy
- Wind moves from pole to equator
- Fire - pyrophilus fungi (mostly ascomycetes)
- Surface texture- topography
- Soil factors- edaphic
- Soil study- pedology
- Soil formation- pedogenesis
- Parasites- regulate the population of plants and animals
- Orchids, mosses- epiphytes- An epiphyte is an organism that grows on the surface of a plant and derives its moisture and nutrients from the air, rain, water or from debris accumulating around it.
- Hult- succession- 1885
- Whole sequence- sere
- Individual- seral stage
- Ozone- $4 \times 10^{-6}\%$ in air
- Macro nutrients- operation of ecosystem

- Micro nutrients- build protoplasm
- Nelumbium- Lotus
- Eichornia- water hyacinth
- Generally sea- 3.5% salt
- Red sea- 4.6% salt
- Baltic sea- 1.2%
- Onychophora- link between Annelida and Arthropoda
- Taiga- Taiga is the Russian word for forest and is the largest biome in the world. The taiga is located near the top of the world, just below the tundra biome. The winters in the taiga are very cold with only snowfall.
- Tropical rain forest- 2000mm rainfall, temp 28°C
- Coniferous forests- plants belonging to gymnosperm group, pine fir spruce are dominant species
- Temperate deciduous forest- forests of temperate region, shed off their leaves during winter season, avg rainfall- 100cm
- Grassland- 19% of Earth, rainfall- 30-75cm, bread basket of the world
- Savannah- semi forest grasslands of tropical region, rainfall 125cm, dry season long, temp 18°C
- Deserts- rainfall below 25cm, 17% of Earth, Sahara hot, Gobi and Idaho cold, Thar desert in Balochistan is called as Thal, temp reaches upto 55°C
- Tundra-
- Arctic- high latitude, sub soil frozen upto 25-90cm termed as perma frost
- Alpine- high altitude, wind velocity 160km/hr, lack trees but have no perma frost Temp -57° to 10°
- Shortest food chain- lose little energy
- Food web- provides stability

CHEMISTRY1

- Standard temp = 0°C or 273K
- Standard pressure= 1atm or 760mm of Hg
- One ounce mole of any gas at standard temp and pressure occupies a volume of 22.4 cubic feet
- $\log 1000 = 3$
- $100 = 2$
- $10 = 1$
- $1 = 0.0001 = -4$
- $0.01 = -2$
- $0.001 = -3$
- $10^{2.4362} = 273$
- $\log 273 = 2.4362$
- Antilog of 5.4060 = 25470
- Antilog 0.4060 = 254200
- Antilog 0.2290 = 1.694
- Vapour pressure of H₂O
- 20- 17.5 torr
- 40- 55.3 torr
- 95- 634 torr
- 100- 760 torr
- Atm pressure same as bp same
- Liquid + impurity = bp inc
- Solid + impurity = mp dec
- Sublimating solids
- Camphor, iodine, solid CO₂, naphthalene
- Max attraction = min energy
- CaCO₃
- Calcite- trigonal
- Aragonite- orthorhombic
- Trigonal also called as rhombohedral
- KNO₃
- Orthorhombic

- Trigonal
- $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
- Monoclinic
- Triclinic
- Thermal velocity- 10^6
- Drift velocity- 10^{-2}
- Density and pressure are ratios of two extensive properties and themselves are intensive properties
- Activation energy of CO > Activation energy of NO
- Order of ionic reac= 10^{-6} sec
- Food is kept safe by freezing
- 5 C - few days
- -5 - -2C - few weeks
- -18C- months
- Phosgene- COCl_2
- Phosphine- PH_3

ATOMIC STRUCTURE

- Electron discovered by Faraday named by Stoney(1891)
- Work on passage of electricity through gases was initiated by Hienrich Giessler and later extended by Crookes
- Pressure and phenomenon
- 1cm of Hg- spark
- Few mm of Hg- electrodes glow
- 1mm of Hg- positive electrode glowing
- 0.001mm of Hg- walls of the tube glow
- Cathode rays are independent of the gas filled in the tube and nature of material of electrodes
- Protons- Goldstein
- J.J.thomson discovered that e/m value of proton is dependent on gas filled
- Proton has mass that is 1836 times that of electron
- Pitchblende- uraninite mineral of uranium, emitted Beta rays
- Radioactivity- Henry Becquerel
- Pierre and Marie Curie isolated radium from the mineral
- Units- curie, becquerel
- The emission of radiation continues until formation of lead as end product
- Alpha rays- 1-2 cm in air
- Beta rays- 1-2 m in air
- Gamma rays- 15-20 cm of lead
- Chadwick- neutron
- Spectroscopic experiments- investigate electromagnetic radiation emitted or absorbed by a substance
- Amount of energy depends on frequency of radiation ν
- $1 \text{ J} = 10^7 \text{ ergs}$
- Sunlight, incandescent lamp- continuous spectrum
- Deviation of light is inversely proportional to wavelength i.e. least deviation red which has max wavelength and violet most deviated having min wavelength
- Light of single wavelength is called monochromatic
- Colour of neon lamps- red
- Sodium lamps- yellow
- Line spectrum- fingerprints of elements
- Rutherford bombarded alpha particles emitted from "POLONIUM" on thin gold foil
- W. Roentgen- 1895 - X rays
- Wavelength of x ray emitted from anode decreased regularly with increasing atomic mass
- Rutherford's theory was supported by Moseley's exp
- Momentum \times circumference also called action is equal to planck's constant $mv \times 2\pi r = h$
- $r = n^2 r_0$ $r_0 = 1/z^2$
- Energy of electron at infinity- zero
- $E = 1/n^2$

- $E = z^2$
- Wave number- waves per unit distance
- Wave number = $1/\lambda$
- First spectral series to be discovered was Balmer series in 1885
- Lyman- ultraviolet
- Paschen- infrared
- Brackett- far infrared
- Pfund- far infrared
- Electrons have dual nature particle and wave
- Bohr's theory was not supported by Heisenberg's uncertainty principle
- If one thing was known exactly then the uncertainty in its determination becomes zero and that of the other becomes infinite
- S- sharp
- P- principle
- D- diffuse
- F- fundamental
- Schrodinger- 1926 calc the probability of locating the electron
- Orbitals- likelihood of finding e is max
- Principal quantum- size
- Azimuthal- shape
- Principal + azimuthal- energy
- Magnetic- orientation
- Spin- spin of e
- Probability of finding e at nodal plane- 0
- No of electrons in a shell- $2n^2$
- No of subshells in a shell - n
- Orbitals in subshell- $2l + 1$
- No of orbitals in a shell- n^2
- No of e in subshell- $2(2l + 1)$
- Radius of Na- 1.57
- $\text{Na}^+ = 0.95$
- $\text{Cl}^- = 0.99$
- $\text{Cl}^- = 1.81$
- $\text{Mg}^{++} = 0.65$
- $\text{Al}^{+++} = 0.5$
- Ions with same electronic configuration are called isoelectronic
- Is me add karlo
- 0.9- 17%
- 1.7- 51%
- Electron affinity- mostly exothermic but grp II A and N have endothermic values E_a of O and S
- First is exo
- Second is endo
- Highest $e_n = \text{F } 4.0$
- Lowest $e_n = \text{Cs } 0.7$
- $E_n \text{ diff} < 1.7 = \text{covalent}$
- $E_n \text{ diff} > 1.7 = \text{ionic}$
- 0.4 = non polar covalent
- 0.4 onwards polar covalent
- **CHEMICAL BONDING**
- Colligative properties- depend on number of particles
- Electrolytic solution- mechanical mixture of solvent molecules and ions
- Ions are free to move like isolated atoms
- 1°C rise in temp increases conductance by 2 - 2.5%
- In galvanic cell Cathode is positive Anode is negative Generally reverse hota hai

- On increasing pressure to 2000 atm the conductance of acetic acid falls to 0.6% of its original value
- Diff of potential created between metal and solution of its salt is called Electrode potential of metal *metal
- No compound is completely ionic
- Molecules are more stable than atoms
- Ionic bond- W. Kossel
- Covalent bond- G. N. Lewis
- Diff of E.N > 1.7 - ionic bond
- NaCl- lattice in which each ion is surrounded by 6 other ions
- $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ - Mg is surrounded by 6 water molecules in octahedral fashion
- $\text{CuCl}_2 \cdot 4\text{H}_2\text{O}$ - Cu surrounded by 4 water molecules in square planar form
- Separate units of ionic compound do not exist
- Insoluble ionic compounds- sulphates phosphates and fluorides of Ca, Ba and Sr
- Electrons shared between two atoms are bonding electrons
- Bond distance is inversely proportional to bond energy and to bond strength
- Covalent compounds exist as distinct particles
- Sidgwick- Dative bond, coordinate covalent, covalent
- The tendency of polar molecule(dipole) to become oriented in electric field- dipole moment
- $1\text{C} = 2.998 \times 10^9 \text{esu}$
- Dipole moments are of order 10^{-30}Cm
- Diff of EN is directly proportional to polarity
- H-F bond is 64% ionic
- H-Cl bond is 17% ionic
- Breaking of bonds- endothermic
- Making of bonds- exothermic
- Heitler, London- 1927 valence bond theory
- 1930's - Hund, Hückel, Mulliken - molecular orbital theory
- Atomic orbital- influenced by one nucleus- monocentric
- Molecular orbital- more than one nucleus- polycentric
- High e density- lower energy- greater stability- bonding molecular orbital
- Low e density- higher energy- less stability- antibonding molecular orbital
- Sigma bond - linearly symmetrical
- S-orbital- spherical charge distribution P-orbital- directional charge distribution s-s < s-p < p-p order of bond strength
- Hybrid orbitals- Linus Pauling
- sp^3 - one fourth s character and three fourth p character
- sp^2 - one third s and two thirds p, molecules are considered to be flat sp - half s and half p
- Electron pair repulsion model- Sidgwick and Powell 1940
- Bond pair and lone pair- active set of electrons
- Repulsion
- Lone pair-lone pair > lone pair-bond pair > bond pair- bond pair
- Pi electrons not considered as active set
- Lone pair- non bonding orbital
- Atoms of Grp V and VI- such as sulphur and phosphorous do not use sp^3 hybridization instead use p orbitals at right angles and form compounds with bond angle 90°
- Hydrogen bond- secondary bond- protonic bridge
- Along the period increases down the group decreases
- HF- 41.8
- NH_3 - 8.4
- H_2O - 29.4
- Highest extent of forming H bonds- H_2O
- Max tendency to form H-bonds- HF
- More no of H-bonds- H_2O
- 4°C - water has maximum density
- $0-4^\circ\text{C}$ - water contracts

- 4-0- water expands
- Size of nucleus- 10^{-14}m
- Size of atom- 10^{-10}m

• PERIODIC TABLE

- 1829 J W Dobereiner Triads
- Li, Na, K
- Cl, Br, I
- Ca, Sr, Ba
- Newland- octaves 1864-69
- Lothar Meyer 1864 extension in 1869, arranged 56 elements, y axis- volume x axis- atomic weight
- Peak- alkali metals
- Ascending order- halogen
- Descending order- alkaline earth metals
- Range of weights of first transition series 400-650
- Mendeleev 1869
- Extension of newland's law
- Eka Boron- Scandium
- Eka Aluminium- Gallium
- Eka Silicon- Germanium
- Period 1 - 2 elements
- 8
- 8
- 18
- 18
- 32
- 7 incomplete
- 4 series of transition- 4th is incomplete
- Lanthanides - Ce to Lu (58-71)
- Actinides- Ac to Lr (89-103)
- Hydrogen does not exist as H^+ in solution but exists as H_3O^+
- Purest method for hydrogen- electrolysis
- Action of steam on coal- total temp 1500°C
- Separating hydrogen from water gas
- Bosch process impure
- Liquefaction and treatment with NaOH- pure method
- $\text{CO}_2 = -200^\circ\text{C}$ liquefaction temp
- $\text{N} = -196^\circ\text{C}$ liquefaction temp
- $\text{H} = -252^\circ\text{C}$ liquefaction temp
- Hydrogen torch- $4000-5000^\circ\text{C}$
- Stadium lamps- tungsten hexafluoride
- Stability of ionic hydrides towards heat decreases with increasing atomic mass
- CaH_2 - is used to prepare hydrogen
- 3 and 4 A are neutral hydrides A are basic and 7 A are acidic
- Acidic strength increases from top to bottom
- Isotopes were discovered by J.J.Thomson
- Tritium half life 12.5 years
- Alkaline earth metal hydroxides are sparingly soluble in water
- Be gives many covalent compounds
- Voltaic cells- solvent is water
- **S BLOCK ELEMENTS**
- Lithium sodium and potassium are less denser than water
- Alkali metals- body centered cubic structure
- Reactivity increases down the group

- Cs is the most reactive
- Be does not form nitride
- Lithium, Be, Mg, Ca - normal oxide
- Sodium, Sr, Ba - peroxide
- Super oxide- K, Rb, Cs
- Be and Mg form protective covering and are protected from extensive corrosion by water
- Sodium and potassium are most abundant in nature
- Down process- cathode anode carbon
- Alumina mp- 2057°C
- ""Carnalite $\text{MgCl}_2 \cdot \text{KCl} \cdot 6\text{H}_2\text{O}$ also an ore of potassium- HEC TEST PHASE 2 ""
- Magnesite- MgCO_3
- Dolomite- $\text{MgCO}_3 \cdot \text{CaCO}_3$
- CaF_2 lowers the mp of CaCl_2
- Barytes BaSO_4
- Whiterite BaCO_3
- Ppt of solvay process- NaHCO_3 (baking soda)
- Na_2CO_3 - soda ash
- $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ - washing soda, water softener
- CaO- quick lime
- Castner Kellner
- Anode titanium
- Cathode mercury
- Hydrogen is easily liberated over graphite surface
- Castner Kellner is being replaced by Gibbs' Diaphragm
- NaOH- deliquescent solid
- Kieserite- $\text{MgSO}_4 \cdot \text{H}_2\text{O}$
- Epsom- $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
- CaSO_4 - permanent hardness in water
- Gypsum $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- At 100°C- forms $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ plaster of paris
- Prof Odling - formula of bleaching powder- CaOCl_2
- Slaked lime- Ca(OH)_2
- 30 elements in p block
- 10 metals
- 20 non metals
- 1 liquid
- 9 gases
- 20 solids

P-BLOCK ELEMENTS

- Boron is a metalloid
- Metallic character of Al is greater than B
- Borax, suhaga, tincal, sodium tetraborate decahydrate- $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$
- Boric acid- monobasic
- At 100 metaboric
- At 140 pyroboric
- Above 240 boron triide
- Inter layer distance in boric acid- 3.18
- Coelomanite- $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$
- Occurrence
- Oxygen
- Silicon
- Aluminium
- Halls - Fe_2O_3 and Silica
- Serpek- silica

- Baeyer- Fe_2O_3
- NaAlO_2 is heated at 50-60 to obtain $\text{Al}(\text{OH})_3$ which is heated at 1500 to get Alumina
- Electrolysis of alumina
- Anode and cathode- carbon
- Cryolite lowers the mp
- Fluorspar (CaF_2) increases the fluidity
- Al obtained is 99% pure
- Al obtained by Hoopes process is 99.99% pure
- Al powder + $\text{Al}(\text{NO}_3)_3$ is ammonal
- Al bronze 10 Al and 90 Cu
- Duralumin 95 Al 4 Cu 0.5 Mg 0.5 Ni
- Al not affected by dry air
- Burns with brilliant white light
- Made passive by nitric acid
- Powerful reducing agent
- Thermite process -3500, used for welding
- X ray is used to distinguish between imitation and pure diamond
- Diamond bond energy 347 KJ/mol or 82.93 Kcal/mol
- Graphite- electrodes, moderator in nuclear reactor
- Interlayer distance of graphite 3.35
- Bond energy 3.99 Kcal/mol or 16KJ/mol
- Triplumbic tetra oxide, lead sesquioxide, red lead Pb_3O_4
- Lead monoxide litharge PbO
- PbCrO_4 occurs in nature as crocoite
- Yellow PbO - massicot
- Red PbO - litharge or murda sang
- Nitric oxide NO
- Nitrous oxide N_2O
- Nitrogen dioxide NO_2
- Nitrate NO_3
- HNO_3 obtained by Ostwald's method is 68%
- Fuming nitric acid- reddish yellow liquid
- Cu with conc HNO_3 - NO_2
- Cu with dil HNO_3 - NO
- Mg with dil HNO_3 - N_2O
- Zn with dil HNO_3 - NH_4NO_3
- Dynamite- nitro glycerine in kieselghur
- Rhombic octahedral alpha sulphur, S-S bond angle 105 and distance 2.12
- Monoclinic prismatic beta sulphur
- 95.5 transition temp
- Antimony trisulphide - Stibnite, pure H_2S is prepared
- H_2S is a strong reducing agent
- Molecule of H_2S is non linear and angle is 92.2 and distance is 1.34
- $\text{H}_2\text{S}_2\text{O}_7$ - oleum
- H_2SO_4 - oil of vitriol
- Conc H_2SO_4 - with Cu gives SO_2
- Zn with conc H_2SO_4 gives H_2S
- Asbestos- $\text{Mg}_3\text{Si}_2\text{O}_8$
- Cl is a greenish yellow gas
- Cl does not readily react with N_2 , O_2 and carbon
- Cl used for layer detection test of Br and I.
- Haematite, magnetite- iron ore
- Lead monoxide litharge PbO
- PbCrO_4 occurs in nature as crocoite

- Yellow PbO - massicot
- Red PbO- litharge or murda sang
- Nitric oxide NO
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- Asbestos- Mg₃Si₄O₁₂
- Cl is a greenish yellow gas
- Cl does not readily react with N₂, O₂ and carbon
- Cl used for layer detection test of Br and I.
- Wohler in 1828 prepared urea by boiling ammonium cyanate with water
- Rubber was isolated in the form of latex from rubber plant

D-BLOCK ELEMENTS

- Ligands are Lewis bases
- EDTA - hexadentate also called flexidentate- HEC PHASE 2
- Copper pyrite- chalcopyrite- CuFeS₂
- Chalcocite- Cu₂S
- Malachite - CuCO₃.Cu(OH)₂ green
- Azurite - 2CuCO₃.Cu(OH)₂ blue
- FeSiO₃- slag
- Matte- Cu₂S + FeS + SiO₂
- Roasted ore- Cu₂S + FeO
- Main impurity in copper- iron
- Refining of copper- 1.3 Volts
- Silver nitrate or Lunar caustic AgNO₃
- Decomposes at 450°C into Ag, NO₂ and O₂
- Ag₂O- dark brown
- Produces white ppt with Cl
- Yellow with I
- Light yellow with Br
- Copper sulphate or Cupric sulphate- blue vitriol or blue stone
- At 230°C loses its water of crystallization
- Cuprous iodide Cu₂I₂ - white
- Cu(OH)₂- pale blue- with ammonia
- [Cu(NH₃)₄]SO₄ - deep blue- with excess ammonia
- Used in making green pigments
- K₂CrO₄- yellow

- CrO_3 - chromic oxide(red)
- CrO_2Cl_2 - chromyl chloride (reddish brown)
- Potassium manganate- green colour
- Potassium permanganate- deep purple
- **Corrosion**
- Iron- brown flaky surface rust
- Copper- green coloured layer
- Zinc- white powder

PREVENTION

- Galvanized iron - protective zinc coating
- Stainless steel- Fe, Cr and Ni
- Amalgam- alloy of tin and mercury
- Liebig in 1938- silvering of mirror
- Metal hydroquinone, pyrogallol- developer, reduces sensitized AgBr to Ag
- $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ - hypo- fixer
- Antirusting agents
- Steel , iron-- dil sulphuric acid
- Copper, brass- ammonium chloride
- 30 elements in p block
- 10 metals
- 20 non metals
- 1 liquid
- 9 gases
- 20 solids
- Boron is a metalloid
- Metallic character of Al is greater than B
- Borax, suhaga, tincal, sodium tetraborate decahydrate- $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$
- Boric acid- monobasic
- At 100 metaboric
- At 140 pyroboric
- Above 240 boron trioxide
- Inter layer distance in boric acid- 3.18
- Coelomanite- $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$
- Occurrence
- Oxygen
- Silicon
- Aluminium
- Halls - Fe_2O_3 and Silica
- Serpek- silica
- Baeyer- Fe_2O_3
- NaAlO_2 is heated at 50-60 to obtain $\text{Al}(\text{OH})_3$ which is heated at 1500 to get Alumina Electrolysis of alumina
- Anode and cathode- carbon
- Cryolite lowers the mp
- Fluorspar (CaF_2) increases the fluidity
- Al obtained is 99% pure And obtained by Hoopes process is 99.99% pure
- Al powder + $\text{Al}(\text{NO}_3)_3$ is ammonal
- Al bronze 10 Al and 90 Cu
- Duralumin 95 Al 4 Cu 0.5 Mg 0.5 Ni
- Al not affected by dry air
- Burns with brilliant white light
- Made passive by nitric acid
- Powerful reducing agent
- Thermite process -3500, used for welding
- X ray is used to distinguish between imitation and pure diamond

- Diamond bond energy 347 KJ/mol or 82.93 Kcal/mol
- Graphite- electrodes , moderator in nuclear reactor
- Interlayer distance of graphite 3.35
- Bond energy 3.99 Kcal/mol or 16KJ/mol
- Triplumbic tetra oxide , lead sesquioxide, red lead Pb_3O_4
- Earth's crust contains only 0.027% C
- Chromite ($FeO.Cr_2O_3$)- chromium ore
- Cr- 3d⁵, 4s¹ (ground state)
- Cu- 3d¹⁰, 4s¹ (ground state)
- Their compounds are ionic in their low oxidation states
- And covalent in their high oxidation states
- The bonding between ligand and metal ion is electrostatic
- Low energy t_{2g} (trio)
- High energy e_g (pair)
- E moves from lower energy set to higher energy set
- Cu absorbs red light and emits blue light
- Fe, Co, Ni are ferromagnetic
- Ni used for hydrogenation
- Fe in manufacture of NH_3
- V_2O_5 to convert SO_2 into SO_3
- Interstitial TiH_{1.73}
- Brass Cu Zn
- Bronze Cu Zn Sn
- Silicon also has the ability to catenate

INTRODUCTION TO ORGANIC CHEMISTRY

- Coal's best form- anthracite
- Bituminous coal- imp source of organic compounds
- Coke- reducing agent, used in steel and iron industry
- Sui gas
- Methane - 94.60
- Ethane- 1.05
- Propane- 0.28
- Butane- 0.17
- Nitrogen- 3.88
- Carbon dioxide- 0.02
- Petroleum means rock oil in latin, called as crude oil
- C₁-C₄- natural gas , bottled gas, petrochemicals -- below 20
- C₅-C₆- petroleum ether, solvents-- 20-60
- C₆-7- ligroin solvents (naptha)-- 60-120
- C₅-10- gasoline-- 40-200
- C₁₂-16 kerosene and jet fuel-- 175-325
- C₁₂- higher- gas oil, fuel oil, diesel oil-- 250-400
- C₂₀- higher- refine mineral/lubricating oil, grease-- non volatile liquids
- C₂₀- higher- paraffin wax, asphalt, tar-- non volatile solids
- Alkanes $C_n H_{2n+2}$
- Alkenes $C_n H_{2n}$
- Alkynes $C_n H_{2n-2}$
- Cyclo alkanes $C_n H_{2n}$
- Isomers
- C₄- 2
- C₅- 3
- C₆- 5
- C₇- 9
- C₈- 18

- C9- 35
- C10- 75
- Metamers are not formed for Carbon atoms below 4
- Ester ketone ether form metamers
- CH_3OH - no isomers
- $\text{C}_2\text{H}_5\text{OH}$ and $\text{CH}_3\text{-O-CH}_3$ are isomers
- HCHO and CH_3CHO form no isomers
- HCOOH forms no isomers
- CH_3COOH (acetic acid) and HCOOCH_3 (methyl formate) are isomers
- Acetone - 10 isomers(chk)
- NHCOR - amide
- Bond energy is directly proportional to bond polarity which is dir pro to en diff in polar molecule
- Potassium chromate + acid \rightarrow potassium dichromate
- Colour changes from yellow to reddish orange
- Potassium dichromate + alkali \rightarrow potassium chromate
- Colour changes from reddish orange to yellow
- MnO_4^- \rightarrow accepts 5e in acidic medium and forms Mn^{+2}
- MnO_4^- \rightarrow accepts 3e in basic or neutral medium and forms MnO_2
- Jis par deposition karwani ho wo cathode aur jis ki karwani ho wo anode
- Methane $\text{C-H} = 1.09\text{\AA}$
- Ethane $\text{C-C} = 1.54\text{\AA}$ $\text{C-H} = 1.1\text{\AA}$
- Ethene $\text{C-C} = 1.34\text{\AA}$ $\text{C-H} = 1.09\text{\AA}$
- Ethyne $\text{C-C} = 1.20\text{\AA}$ $\text{C-H} = 1.09\text{\AA}$
- Benzene grp changes -- nucleophilic reaction
- Ring par reaction -- electrophilic
- Inductive reasoning -- specific to general
- Deductive reasoning -- general to specific
- Gram negative bacteria -- more resistant to antibiotics
- Hydroponics- soil less or water culture
- Interplanting also called as poly culture
- Vaccine- Edward Jenner 1795
- $\sin 30^\circ = 0.5$
- $\sin 20^\circ = 0.3$
- $\sin 10^\circ = 0.1$
- $1\text{u} = 1.67 \times 10^{-27} \text{ kg}$
- $1\text{kg} = 6.02 \times 10^{26} \text{ u}$
- Covalent bond stores large amount of energy
- In amino acid
- R in glycine is H
- In serine is CH_2OH
- In alanine is CH_3
- In valine is $\text{CH}_3\text{-CH}_2\text{-CH}_2$
- No of aminoacid= peptide linkage + 1
- No of peptide linkage= no of aminoacid - 1
- Primary structure= linear bond is peptide Sec= helix bond is hydrogen and sulphide
- Ter= 3D bonds are peptide, hydrogen, ionic and disulphide
- Quat= 4D bond is peptide
- Protein= 50% weight of cell
- Carbs= 1% by weight
- Wax contains one molecule of fatty acid
- Mineral oil is called petroleum when it is in refined form and when extracted is called as crude oil
- Paraffin mp 50-60
- Fractional distillation of petroleum yields 20% gasoline
- Catalytic cracking- zeolite, silica and alumina temp 500

- Steam cracking temp 900
- Iso octane or 2,2,4- trimethyl pentane has been given octane number 100
- 2 benzene rings- naphthalene 3 benzene rings- anthracene
- Alcohol or alkanol
- Simplest hydrocarbon to have structural isomers is butane
- Methane ethane propane- no isomerism
- Pentane has 3 isomers
- Electrolytic method- only symmetrical alkanes, methane cannot be prepared by this method From carbonyl compounds- Clemmensen or Wolf-Kishner's reduction
- C1-C4 = gases
- C5-C17= liquids
- C18-- = solids
- Bp increases by 20-30 for addition of every CH₂ group
- Straight chain alkanes have higher bp than branched chain alkanes
- Burning of alkane in presence of oxygen- combustion
- In absence of oxygen- cracking
- Nitroalkanes are used as fuels, solvents
- Order of reactivity of halogen
- F>Cl>Br>I>
- **CHEMISTRY OF HYDROCARBONS**
- Methane used as illuminating gas, manufacture urea fertilizer
- Ease of dehydration of alcohols
- Tertiary(85°)>Secondary(100°)>Primary(140-170°)
- Succinic acid is dicarboxylic acid
- Quinoline (Lindlar's catalyst)
- Trans alkene - Na/liquid NH₃
- Order of reactivity of halogen acids
HI>HBr>HCl
- Bromination of alkene, Baeyer's reagent test(1% KMnO₄) - test for detection of double bond
- Epoxides- starting materials for production of glycols
- Reduction of ozonides- ketones and aldehydes
- Ozonolysis used to detect position of double bond
- Polymerization - good catalysts- aluminium triethyl and titanium tetrachloride
- Ethene- artificial ripening of fruits
- Mustard gas is a liquid
- Vesicant - causing blisters
- Glycols are used as antifreeze
- Ethyne- garlic like odour
- Reactivity
- Ethene>ethyne>ethane
- Vinyl alcohol- unstable enol
- Ethyne gives aldehyde with water
- Rest all alkynes give ketones
- Isolated benzene rings
- Biphenyl, diphenyl methane
- Fused rings
- Naphthalene, phenanthrene, anthracene
- Order of priority in naming benzene
- COOH, CN, CHO, COCH₃, OH, NH₂, OR, R
- C-C= 1.39
- C-H= 1.09
- 150.5KJ/mol or 36Kcal/mol = resonance energy
- Ethyne - organo nickel catalyst 70°- benzene
- Substitution of halogen in benzene requires iron or corresponding ferric halide as catalyst

- Nitration
- 1:1 ratio of H_2SO_4 and HNO_3
- Combustion of one mole of benzene requires 7.5 moles of O_2
- On ozonolysis benzene gives glyoxal
- Side chain oxidation by KMnO_4 of benzene - test for alkyl benzenes
- Chance basis
- 40% ortho, 40% meta, 20% para
- Density $\text{H}_2\text{O} > \text{air} > \text{methane}$
- Oxidation
- Alkane \rightarrow Alcohol \rightarrow Aldehyde \rightarrow carboxylic acid
- Alkanes- Paraffins
- Alkenes- Olefins
- Ethene undergoes electrophilic addition
- Raney nickel
- Nickel/Aluminium Alloy + NaOH
- Ethene + H_2SO_4 (cold conc) \rightarrow Ethyl alcohol
- Mustard gas- S_2Cl_2 is actually a liquid β, β - dichloro diethyl sulphide
- Ethyne explodes on compression to a liquid
- Oxyacetylene flame - 3000°C
- Benzene causes blood cancer
- Chlorination of benzene catalyst- iron or FeCl_3

Benzene undergoes electrophilic substitution

- **ALKYL HALIDE**
- Alkyl halide by halogen in presence of catalyst ZnCl_2
- Alkyl halide by SOCl_2 in presence of pyridine
- Alkyl iodides cannot be prepared by direct iodination
- Order of reactivity of alkyl halides
- $\text{RI} > \text{RBr} > \text{RCl} > \text{RF}$
- Nucleophile- nucleus loving
- Electrophile- electron loving
- Electrophile can be neutral or positively charged
- Cl Br I HSO_4 are good leaving groups
- Iodide is a good nucleophile and a good leaving group
- $\text{S}_\text{N}2$ and $\text{E}2$
- Bimolecular
- Second order kinetics
- No solvent necessary
- Primary always follow this
- Rate depends on both nucleophile and substrate alkyl halide
- Requires strong nucleophile and a good leaving group
- $\text{S}_\text{N}1$ and $\text{E}1$
- Unimolecular
- First order kinetics
- Solvent required (aqueous acetone or alcohol)
- Ion formation occurs
- Carbocation is intermediate
- Rate depends on substrate only
- Weak nucleophile may also suffice
- Tertiary always follow $\text{S}_\text{N}1$
- Sec in polar medium follow $\text{S}_\text{N}1$ and $\text{E}1$ and in non polar medium follow $\text{S}_\text{N}2$ and $\text{E}2$
- Wurtz reaction- symmetrical alkanes
- Tetramethyl lead and tetraethyl lead- good antiknock agents and used in gasoline
- Reactivity of alkyl halide with Mg
- $\text{RI} > \text{RBr} > \text{RCl}$

- And for a given halogen
- $\text{CH}_3\text{X} > \text{C}_2\text{H}_5\text{X} > \text{C}_3\text{H}_7\text{X}$
- In grignard reagent carbon has a negative charge therefore electrophiles attack and nature of reaction is electrophilic
- Most reactions of grignard reagent are exothermic
- CN-CL cyanogen chloride
- With CO_2 - carboxylic acid
- With formaldehyde- primary alcohol
- Any other aldehyde- sec alcohol
- Ketone- ter alcohol
- With Epoxide- Alcohol(chk)
- Alcohol phenol ether are considered derivatives of water
- Ethanol structure resembles to water
- Ethane diol - glycol
- Propanetriol- glycerol
- 2 hydroxy propanoic acid - lactic acid
- 2,3 di hydroxy butane 1 4 dioic acid- tartatic acid
- Yeast 14 enzymes
- Optimum temp for fermentation 25-35
- Alcohol obtained by fermentation is 12% and never exceeds 15%
- C-O bond break - nucleophilic O-H bond break- electrophilic
- Order for nucleophilic reaction
- Ter>sec>pri
- Order for electrophilic
- Methyl>pri>sec>ter
- Oxidation of alcohol- ketones and aldehydes
- Ter alcohols are resistant to oxidation and undergo elimination but acc to sindh book they undergo oxidation and give ketones
- Pri sec and ter alcohols are distinguished by lucas test
- Ter forms oil layer immediately
- Sec after 5-10 mins
- Pri forms on heating
- **CHAPTER#9**
- Methanol- antifreeze
- Ethanol- fuel substitute, preservation of biological specimen
- Phenol - coaltar - runge 1834
- Phenol is a colourless crystalline deliquescent solid
- Used as disinfectant
- Phenols are less reactive to nucleophiles as OH is a poor leaving group
- Acidic character
- $\text{COOH} > \text{Phenol} > \text{water} > \text{Alcohol}$
- $K_a = 1.3 \times 10^{-10}$
- Ph 5.6
- Trinitro phenol - picric acid. It is a phenol which behaves like an acid.
- Phenol test- reaction with bromine - white ppt
- Alkoxide ion is a strong nucleophile
- Ethers are volatile liquids
- Ethers are relatively inert . They do not react with dilute acids alkalies ammonia metallic sodium etc.
- They do react with hot PCl_5 to give alkyl halide.
- Aldehyde present in most sugars
- Ketone is present in camphor and menthone
- Catalyst for industrial preparation of formaldehyde- platinised asbestos or copper or silver catalyst
- Formalin- 40% formaldehyde, 8% methyl alcohol and 52% water
- Oxidation of ethene in presence of palladium chloride with cupric chloride as promoter gives acetaldehyde

- Nucleophilic addition reactions occur in ald and ket
- Base catalyzed- increases the nucleophilic character, strong nucleophile
- Acid catalyzed- promotes nucleophilic attack by increasing electrophilic character
- React with bisulphite- used for separation and purification of carbonyl compounds
- Ketones in which both alkyl groups are larger than methyl do not react with sodium bisulphite
- Cannizzaro
- Formation of alcohol is reduction And
- formation of salt is oxidation (chk)
- Acetaldehyde and methyl ketones react with halogen in presence of NaOH to give haloform. Ethanol is the only pri alcohol to give this reac. Sec alcohol containing OH group on C no 2 undergo haloform reaction
- Identification of ald and ket- 2,4 DNP
- Aldehydes are reduced to pri alcohols and ketones to sec alcohols
- Ald and ket on oxidation give carboxylic acid
- Aldehydes do not give sodium nitroprusside test
- Formaldehyde- used in processing of polio vaccine
- Ethanedioic acid - oxalic acid
- Propanedioic acid- malonic acid
- 1,2 benzene dicarboxylic acid Pthalic acid
- 1,4 benzene dicarboxylic acid Terephthalic acid
- Irritation due to ant bite - formic acid
- Alkenes when heated with alkaline KMnO_4 form carboxylic acids
- Formic, acetic, propionic - pungent smell
- Butyric, valeric, caproic- unpleasant smell
- Carboxylic acids exist as cyclic dimers
- Mp of carboxylic acids with even no of C atoms are higher than the next lower and higher member with odd number of C atoms
- The OH group can be replaced by X OR and NH_2
- Characteristic reaction - nucleophilic substitution (chk)
- Esters have fruity smells and are used for artificial flavours
- Amylacetate- banana
- Isobutyl formate-raspberry
- Benzylacetate- jasmine
- Ethyl butyrate- pineapple
- Amyl butyrate- apricot
- Octyl acetate- orange
- Carboxylic acid reduction with LiAlH_4 produces alcohols
- COOH on reduction with HI and red Phosphorous gives alkanes
- The pure acetic acid freezes to an ice like solid at 17°C therefore called as glacial acetic acid
- Used as local irritant

CHAPTER 10 ORGANIC

Twenty aminoacids req by body- our body can synthesize only ten

- Glycine- named cause of sweet taste
- Tyrosine- first isolated from cheese
- **Neutral**
- Glycine
- Alanine
- Valine
- Proline
- Acidic
- Aspartic
- Glutamic
- **Basic**
- Lysine

- Histidine
- The dipolar structure of amino acid is also called internal salt
- Strecker synthesis
- HCN added to aldehyde in presence of NH_3 yields alpha amino acid
- Amino acids react with nitrous acid to produce alpha hydroxy carboxylic acid
- Peptide having molecular mass upto 10000 is called polypeptide
- While having more than 10000 is a protein
- Aliphatic carboxylic acids are also called fatty acids.
- Ether and alcohol are interconvertible
- Ester and Carboxylic acid are interconvertible
- Aldehyde and ketone are
- Soda lime- $\text{NaOH} + \text{CaO}$
- RSH - thioalcohols or mercaptans
- Species with positive charge on carbon- carbonium ion
- Mechanism of elimination- Hughes and Ingold (1941)
- pH above 10 or below 3 is sterile
- Chile saltpeter NaNO_3
- Triple phosphate contains P_2O_5 about 48% which is thrice of what is present in super phosphate
- Carboxylic acid like Ca and Mg salts are insoluble in water
- Glass is prepared at 1400°C
- Ordinary glass - sodium and calcium silicates
- Refractory potassium glass - K_2CO_3
- Pyrex- borosilicate
- Coefficient of expansion- inversely proportional to expansion
- CuO - light blue
- CoO - dark blue
- Cr_2O_3 - green
- SeO and ZnO - red
- Rayon- chardonnet 1884
- Sodium cellulose xanthate- viscose rayon
- Both monomers diff- copolymer
- ""1,4 benzene dicarboxylic acid- terephthalic acid
- 1,2 benzene dicarboxylic acid - phthalic acid
- Both are isomers ""
- Polypropylene is superior to polyethylene in its resistance to breakage and temperature
- Plasticizer- reduces brittleness and improves elasticity
- Diastase- in malt
- Ethanol bp- 78.5
- Molasses- thick brown dark coloured syrup left after isolation of cane sugar
- Ethanol structure resembles that of H_2O
- Ethoxide is a strong nucleophile
- Reac of ethanol with sodium shows acidic nature
- Phenol is poisonous
- Miscible with water above 68.5
- Phenol with dil nitric acid gives o p products
- With conc gives picric acid
- Phenol- ink preservative
- Formaldehyde- gas at ordinary condition
- In aldol condensation base is used as catalyst
- Sodium amalgam and water - gives off nascent hydrogen
- Sodium and alcohol- gives off nascent hydrogen
- Formaldehyde with fuming nitric acid gives explosive cyclonite used in WW 2
- In diabetes quantity of acetone increases
- Acetic acid- nail polish remover, artificial scent, smokeless gun powder, synthetic rubber

- Formic - ants
- Acetic- vinegar
- Propionic- milk butter cheese
- Butyric- butter
- Valeric- valerian root
- Caproic- goat
- Anhydrous acetic acid- hygroscopic
- H_3PO_3 - is a dibasic acid
- Ethyl acetate- plasticizer
- In plants fats are stored in seeds
- Gelatin lacks tryptophane

Feints of corn lack tryptophane and lysine

- Glucose and protein- energy donors
- Fats cant act as energy donors? Bk line
- Fat soluble vits are stored in liver
- 23 elements essential for us
- 11 non metals and 12 metals
- Eggs cereal meat- acid forming foods
- Fruits vegetables- base
- Fats sugars- neutral
- Water is gained mainly from 3 main sources
- Rhamnose- carb but general formula is not $\text{C}_x(\text{H}_2\text{O})_y$
- Glyceraldehyde- aldotriose
- Glucose- 2 isomeric closed chain structures
- Glucose- pyranose
- Fructose- furanose
- Hexose not found free in nature- Galactose
- Glucose galactose- diff is in C no 4
- Sucrose- $\alpha \beta$ 1:2 glycosidic linkage
- Maltose- $\alpha \beta$ 1:4
- Lactose- $\beta \beta$ 1:4
- Amylose α glucose 1:4
- Amylopectin α glucose 1:4, 1:6
- Cellulose 2000 β glucose 1:4
- Oxidation of glucose gives 2832KJ energy
- Carbon of amino acid- chiral carbon
- Phenylalanine, tyrosine, tryptophan contain benzene ring
- Aminoacids- solids
- dalton= 1amu
- Hydrolysis of proteins with dil acid gives alpha amino acid
- Albuminoids are proteins which are only dissolved by hydrolysis
- Collagen- connective tissue of silk muscle and chitin
- Insulin- 2 polypeptide chains containing 51 amino acids
- Bloor's reagent
- Diethyl ether: alcohol
- : 1
- All essential fatty acids are unsaturated
- Coconut oil - fat in one season oil in other
- Drying oils undergo oxidation forming peroxides
- Amoeba- microphagous- food vacuole- digestion by lysosomes- intracellular
- Rancidification
- Hydrolysis of ester linkage giving fatty acid
- Oxidation at double bond forming aldehyde

- Saponification- reverse of esterification
- Complex lipid- 2 fatty acids and other compound
- Cholesterol is present in blood brain tissues and spinal column
- Cofactors permanently bonded- prosthetic grp
- Transient association- coenzyme
- Inactive form- proenzyme or zymogen
- Molecular weight of water soluble proteins is high
- Vitamins - accessory food factors
- Bacteria in intestine- folic acid and vit K
- Rats have - vit C
- Vitamin nameLy- Mecollum
- Vit A
- Precursor- Carotene, converted in intestine to vit A
- Retinol
- 1000 microgram
- Vit D
- Antirachitic
- Calciferol (D3)
- Plants - ergosterol converted to D3
- Animals- f dehydrocholesterol- D2
- 7.5 microgram
- Vit E
- Tocopherol
- 10 mg
- 3 methyl grps on benzene ring
- Vit K
- Antihaemorrhagic
- Menadione
- 70-140 microgram
- Vit B complex
- B12- contains cobalt
- B1- thiamine - aneurin, formed from pyrimidine amd thiazole residues
- 1.1-1.5 mg
- B2- riboflvin, lactoflavin
- 6:7 dimethyl- 9- D- pribitylisoalloxazine
- 1.3-1.7 mg
- B6- pyridioxine
- 2.2 mg
- Niacin
- Nicotinic acid, nicotinamide
- Derived from pyridine
- 14-19 mg
- Vit C
- Abscorbic acid
- $C_6H_8O_6$ - MF
- $C_3H_4O_3$ - EF
- Facilitates absorption of iron

PHYSICS

- f the earth stops rotating value of g will remain unchanged at
- Poles
- If the earth stops rotating value of g at equator
- Increases
- If the earth stops rotating "suddenly" value of g at equator

- Decreases
- $\sin 30^\circ = 0.5$
- $\sin 20^\circ = 0.3$
- $\sin 10^\circ = 0.1$
- $\sin 40^\circ = 0.6-0.7$ ke darmian hoga
- Ionizing power (greatest to smallest)
- $\text{Alpha} > \text{proton} > \text{beta} > \text{gamma} > \text{neutron}$
- Alpha & proton (by electrostatic repulsion)
- Beta (by repulsion)
- Gamma (by photoelectric effect, Compton effect or materialization)
- Neutron (by direct impact)
- Neutron knocks out e^- with no change in its own velocity.
- P-N junction is reverse biased in solid state detector
- Radiations r used as tracers, therapeutic agents, sterilizing agent
- Ca-45 deposits
- 90% in young bones
- 40% in old
- Gamma rays of Co-60
- & Energetic X rays r used for cancer
- I-131 for cancer of thyroid
- Radiation techniques may be used for chemical reactions like polymerization, cosmic rays processes etc.
- On the top of Earth atmosphere cosmic rays r mostly high energy protons of upto 10^{18} eV , He(15%) ,C,N,O (less Than 1%)
- Uses of radiation:
- Polymerization,
- Sterilizing & food preservation
- Gauging & control,
- Radiography (e.g., x-rays for finding porosity, cavity, informity in metal casting, cracks or imperfection in welding joints)
- Archaeology (by radio carbon dating)
- Activation analysis
- C-14 half life 5730 yes
- Ratio of C-14 to C-12 in plants is 1.5×10^{-12}
- U238, Cl36 also used for this
- Gamma rays spectrometer is used to measure emitted energies of gamma rays in activation analysis particularly neutron activation analysis
- Galactic cosmic ray flux during intense sun spot activity decreases a bit, causing magnetic effect Geiger counter
- Detects ionising particles or radiations
- Has liquid mixture at about 50-100mm Hg
- Resistance = 10^9 ohms
- Requires at least 1000V
- Alpha particle loses about 35 eV energy in each collision
- 7.7MeV alpha particle from RaC (Bi-214) produces 0.2×10^6 ions before it stops
- Range of alpha particle
- In air = 7×10^{-2} m
- In Al only 4×10^{-5} m
- Solid state detector is convenient bcs it requires low voltage of 9volts only
- Wilson cloud chamber visualize the path of ionizing particles
- Protons ionising power is $1/5$ that of alpha
- Range of beta is nearly 100 times of alpha and ionizing is $1/100$ of alpha
- 5×10^{-3} in Aluminum
- Fluorescence is produced when Beta strikes Calcium stugnate and barium platinocynide
- Beta particles velocity is $c/5$
- Enough from Ch.20

- Packing fraction of deuteron is 1.1 MeV
- Neutrino is neutral electron
- B.E/nucleon of hydrogen is 1.12 MeV
- 7.07MeV for Helium
- Two positions is 26.7 MeV
- Nuclear fission produces 10^9 more energy than coal furnace
- Nuclear fuel= fissionable isotope= fissile
- U235 (0.715% in natural abundance or in enriched proportion)
- Moderators=light water (attractive bcs of low cost) or D2O(best) or graphite or Beryllium(& it's oxide) or organic compounds.
- Coolants(H2O,D2O, liquid metals like Na- or K- alloys or Mercury, organic liq. & Gases) should
- Not absorb or moderate neutrons
- Not induce any chem. Effect
- Not break up under radiation effect
- Be capable of acquiring long lived radioactivity
- Have low Vapor pressure at operating temp
- *Able to remove large heat quantities on small input pumping power
- Control materials
- *Cd
- *Ag+ 15%In +5%Cd
- *Boron
- *B+ stainless steel
- B+ Al
- *B+Carbon
- Biological shielding by few cm Iron or steel
- Pu half life= 2.44×10^4 yr
- M.P of Na= 98°C
- B.P of Na= 892°C
- Na has high sp. Heat & good fluid for heat transfer
- Nuclear changes employ conservation of nucleon number, Z, E, P(momentum) , l (angular momentum)
- 200MeV I. Breeder reactor
- Packing fraction = mass defect/ nucleon
- Binding fraction = B.E/ nucleon
- For heavy elements like Fe,Co,Ni B.E/nucleon is up to 8 MeV
- Radioactive decay is exponential in nature
- Half life of
- Ra= 1590 yrs(long lived)
- Rn= 3.825 days (short lived)
- Ch.9
- Huygen's wave theory explained laws of reflection,refraction,double refraction
- But
- Failed to explain photoelectric effect
- Corpuscular theory is supported by photoelectric effect & Compton effect
- Wave nature is confirmed by
- Young's double slit interference,
- Thin film interference,
- Diffraction in Rock salt(X-rays), polarization
- $c=2.988 \times 10^8$ m/s
- Faraday says, changing B w.r.t time acts as electric field and vice versa
- Mutually perpendicular magnetic & electric field in light wave oscillate in unison to give same frequency & identical phase
- Visible light is radiation affecting human eye
- Longest visible red=>
- Wavelength = 7.6×10^{-7} m

- Frequency= 3.9×10^{14}
- Shortest blue= \Rightarrow
- Wavelength= 4.0×10^{-7} m
- Frequency= 7.5×10^{14}
- Frequency & wavelength scales r logarithmic
- Plane wavefronts:
- Disturbances unidirectional
- Spherical wavefronts:
- Disturbances multidirectional
- Spherical wavefronts reduce to plane wavefronts under certain conditions

IMPORTANT

#Biology_cramming_points

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