

STUDY GUIDE

PHYSIOLOGY

FIRST YEAR *mbbs*

SESSION 2018-2023

SAHARA MEDICAL COLLEGE,

NAROWAL

SAHARA MEDICAL COLLEGE, NAROWAL

PHYSIOLOGY DEPARTMENT

LEARNING OUTCOMES OF PHYSIOLOGY (1ST YEAR MBBS)

1st TERM (10 Weeks)

Cell Physiology (02 Weeks)

1. Introduction to physiology
 - Define human physiology.
 - Understand Specific characteristic and mechanism of human body.
2. Homeostasis- negative feed back
 - Define and explain Homeostasis, its components.
 - Explain Homeostasis mechanism of action.
 - Explain negative feedback system.
 - Elaborate the negative feedback system`s example.
3. Homeostasis- positive feed back
 - Explain positive feedback system.
 - Elaborate the positive feedback system`s example.
4. Cell membrane structure and functions
 - Describe the Cell membrane structure and composition.
 - Have clear concept of structure models (fluid mosaic model).
 - Elaborate the functions of cell membrane.
5. Cell organelles-1
 - Describe structure, types and functions of Endoplasmic reticulum.
 - Discuss structure and functions of Golgi apparatus.
 - Explain structure and functions of Lysosomes.
 - Understand structure and functions of Peroxisomes.
 - Elaborate structure and functions of Centrosome and Centriole.

6. Cell organelles-2
 - Explain structure and functions of Mitochondria.
 - Discuss structure and functions of Ribosomes.
 - Describe structure and functions of Secretory vesicles.
 - Elaborate structure and functions of Cytoskeleton.
 - Mention structure and functions of Nucleus.
7. Functional system of the cell (pino and phagocytosis)
 - Describe the functional system of the cell.
 - Describe Phagocytosis and Pinocytosis and its mechanism.
8. Locomotion of the cell & Characteristics and functions of ATP
 - Define and explain locomotion.
 - Describe the concept of Ameboid locomotion.
 - Describe the concept of Ciliary movements.
 - Understand the synthesis of ATP.
 - Describe the five functions of ATP.
9. Genetic control of protein synthesis (DNA structure, genetic code, transcription)
 - Understand the significance of DNA, its structure.
 - Explain concept of gene replication and gene mutation.
 - Explain the transcription and its mechanism.
10. Genetic control of protein synthesis (RNA structure, translation)
 - Understand the significance of RNA, its structure.
 - Describe the concept of RNA types and their functions.
 - Explain the translation and its mechanism.
11. Genetic regulation
 - Describe the concept of genetic structure of DNA.
 - Explain the genetic codons and anti codons.
 - Describe the gene expression.
 - Understand the regulation of gene.
12. Cellular division, Differentiation, Apoptosis
 - Describe the cell division by Mitosis and Meiosis and their stages.
 - Define and explain the cell Apoptosis.

Blood & Immunity (04 Weeks)

1. Introduction to blood physiology, functions & composition
 - Describe properties of blood and its composition.
 - Explain the functions of blood.
 - Discuss plasma, serum & blood cells.
2. Plasma proteins
 - Describe types of plasma proteins, their normal values.
 - Explain the functions of plasma proteins.
 - Elaborate methods of separation of plasma protein.
3. Introduction to RBC, Erythropoiesis, stages, site of synthesis
 - Understand RBC morphology.
 - Explain properties of RBC and its variations.
 - Describe erythropoiesis and its site.
 - Describe stages of erythropoiesis.

- Remember the duration of erythropoiesis.
4. Regulation of Erythropoiesis
 - Enlist factors necessary for erythropoiesis.
 - Describe the mechanism of its regulation.
 5. Hemoglobin and its synthesis
 - Describe structure and functions of hemoglobin.
 - Describe content of hemoglobin and its variation.
 - Know about the synthesis of hemoglobin.
 6. Hemoglobin catabolism
 - Describe catabolism of heme and globin.
 - Describe normal and abnormal hemoglobin.
 7. Iron metabolism
 - Explain the daily iron requirement, its absorption, storage and transport.
 - Describe Regulation of total iron in body and its importance.
 8. Blood indices & PCV:
 - Discuss PCV and RBC count.
 - Define all blood indices.
 - Calculate the blood indices.
 - Know normal values and have concept of its importance.
 9. Anemia classification:
 - Define and classify anemia.
 - Know normal hemoglobin values and its variations.
 - Discuss effect of anemia on body.
 10. Anemias and their morphology, description
 - Describe different anemias and its cause.
 - Differentiate the morphology and treatment of different anemias.
 11. Polycythemias:
 - Describe polycythemias and its types.
 - Describe effects of polycythemia on function of the circulatory system.
 12. Platelets and its functions:
 - Describe morphology of platelets.
 - Describe its normal count and its variation and properties.
 - Explain development and life span of platelets.
 - Describe functions performed by platelets.
 13. Thrombocytopenia & ESR:
 - Describe thrombocytopenia, its types.
 - Elaborate thrombocytopenia's effects on body and circulation.
 14. Blood groups:
 - Enlist the various blood group system and Landsteiner law of ABO blood group.
 - Discuss inheritance of ABO group system.
 - Describe blood typing and matching and cross matching.
 - Elaborate the significance of universal donor and recipient.
 15. Rh blood type & erythroblastosis fetalis:
 - Explain the Rh blood group factors and their inheritance.
 - Describe inheritance of ABO group system.
 - Discuss blood typing and cross matching.

- Describe erythroblastosis fetalis, its prevention and treatment.
16. Transfusion reactions and jaundice
 - Describe various transfusion reactions in matched blood and not matched blood.
 - Classify immediate and delayed transfusion reactions.
 - Describe jaundice and explain its treatment and difference between jaundice and hyperbilirubinemia.
 17. Hemostasis with events
 - Define the hemostasis.
 - Describe the events of hemostasis in an injured vessel.
 18. Blood coagulation & Clotting factors, intrinsic pathway
 - Define the coagulation and its role in hemostasis.
 - Enlist various clotting factors.
 - Describes the factors required to conduct this pathway.
 - Explain the role of calcium in this pathway.
 - Explain the sequence of event in this pathway.
 19. Extrinsic pathway & fate of clot
 - Describes the factors required to conduct this pathway.
 - Explain the role of calcium in this pathway.
 - Explain the sequence of event in this pathway.
 - Describe the fate of clot after healing.
 20. Hemophilia & purpura; bleeding disorders
 - Describe hemophilia, its types.
 - Describe purpura, its types.
 - Explain vonwillibrand disease.
 21. Coagulation tests and anti coagulants
 - Describe various anticoagulation and their mechanism of action
 - Describe various coagulation test.
 - Mention their normal values.
 - Elaborate their role in diagnosis of diseases.

Nerve & muscle (04 Weeks)

MEMBRANE PHYSIOLOGY

1. Simple & facilitated diffusion
 - Define simple & facilitated diffusion.
 - Enlist the substances which can diffuse through cell membrane.
 - Enlist differences between simple & facilitated diffusion.
 - Describe the factors that affect the net rate of diffusion.

2. Osmosis/ Active transport & its types
 - Define osmosis
 - Discuss osmotic pressure.
 - Discuss the importance of osmotic particles in determining osmotic pressure.
 - Differentiate between osmolarity & osmolality.

- Discuss the relation of osmolality to osmotic pressure.
- Define active transport.
- Describe the different types of active transport.
- Describe the Sodium-Potassium pump & its function.
- Differentiate between primary active & secondary active transport.
- Enumerate the substances that can be transported by this process.

NERVE PHYSIOLOGY

1. Introduction - Types of neuron & neuroglial cell
 - Describe the structure of neuron & its different functional zones.
 - Classify the neurons on different basis.
 - Describe the glial tissue & its types.
2. Classification of Nerve fibers / Properties of nerve fibers
 - Classify nerve fibers.
 - Classify the nerve fibers on structural and functional basis.
 - Describe the properties of nerve fibers.
3. Membrane potential/ Calculation of Nernst & Goldman equation
 - Discuss the ionic basis of membrane potential.
 - Describe membrane potential.
 - Explain the Nernst equation.
 - Discuss the Goldman equation.
4. Resting membrane potential
 - Define RMP and mention its value.
 - Discuss the ionic basis of origin of RMP.
5. Action potential & its phases-1/ Voltage gated channels(Sodium & potassium)
 - Define action potential.
 - Describe the different phases of action potential.
 - Discuss the role of different ions during the different phases of action potential.
6. Action potential & its phases-2/ Propagation of action potential
 - Describe the steps of propagation of action potential.
 - Differentiate between conduction in myelinated and unmyelinated nerve fibers.
 - Describe the significance of saltatory conduction.
7. Graded Potential & its types
 - Define graded potentials.
 - Enlist the various types of graded potentials.
 - Differentiate between graded potentials & action potentials.
8. Action potential with plateau, chronaxie, rheobase & compound action potential
 - Define refractory period.
 - Mention the different types of refractory period.

- Describe the basis of refractory period.
 - Define rheobase and chronaxie.
 - Describe compound action potential.
9. Degeneration & Regeneration of nerve fibers/ Properties of synapses
- Define Wallerian degeneration.
 - Describe the different steps involved in regeneration of nerve fibers.
 - Define synapse.
 - Enlist the types of synapses.
 - Describe the various properties of synapses.

MUSCLE PHYSIOLOGY

1. Physiological anatomy of skeletal muscle
 - Describe the general structure of skeletal muscle.
 - Describe the T-tubule and mention the different parts of sarcoplasmic reticulum.
 - Discuss the different types of filaments present in skeletal muscle.
 - Differentiate between dark and light bands.
2. Properties of muscles
 - Describe the various properties of muscles.
 - Define contractility, excitability.
3. Molecular mechanism of muscle contraction(sliding filament theory)
 - Describe the molecular characteristics of contractile filaments.
 - Describe the interaction between filaments to cause contraction.
 - Describe the sliding filament mechanism.
4. Walk-Along Theory & chemical events in motion of myosin head, rigor mortis
 - Describe the role of calcium ions in activating actin filaments.
 - Discuss the walk-along theory of contraction.
5. Neuromuscular Junction & transmission/ Excitation-contraction coupling
 - Describe the structures involved in neuromuscular junction.
 - Describe the various steps involved in neuromuscular transmission.
 - Discuss the various steps involved in excitation contraction coupling.
 - Describe the role of calcium in excitation contraction coupling.
6. Drugs acting on neuromuscular junction& Myasthenia Gravis
 - Discuss the effect of different drugs that act on NMJ.
 - Discuss the causes, effects & treatment of myasthenia gravis.
7. Characteristics of whole muscle contraction/ Length-tension relationship & energetic of muscle contraction
 - Discuss the differences between isotonic & isometric contraction.
 - Discuss the differences between slow and fast fibers.
 - Discuss the relationship of muscle length to tension.

- Discuss the relationship of velocity of contraction to load.
 - Discuss the sources of energy for muscle contraction.
8. Mechanics of Skeletal muscle contraction
 - Define motor unit.
 - Define summation & describe the different types.
 - Differentiate between tetany, tetanus and tetanization.
 - Define muscle twitch.
 9. Remodeling of muscle and disorder (dystrophy)
 - Discuss the causes and effects of muscle hypertrophy and atrophy.
 - Differentiate hypertrophy and hyperplasia.
 - Describe macro-motor units and its importance.
 - Discuss the causes and effects of rigor mortis.
 10. Smooth muscle- types, structure /Regulation of smooth muscle contraction
 - Classify the smooth muscles.
 - Describe the structure of smooth muscle.
 - Enumerate the differences between smooth & skeletal muscle.
 - Enumerate & describe the various steps involved in smooth muscle contraction.
 - Discuss the role of calcium ions in smooth muscle contraction.
 11. Nervous & Hormonal control of smooth muscle contraction// Differences between skeletal, smooth & cardiac muscle
 - Describe the types of NMJ associated with smooth muscles.
 - Discuss the various types of action potentials in smooth muscle.
 - Discuss the effect of various tissue chemical factors & hormones on smooth muscle contraction.
 - Enumerate the differences between skeletal, smooth and cardiac muscles.

2nd TERM

Cardiovascular System (09 Weeks)

HEART PHYSIOLOGY (04 Weeks)

1. Cardiac muscle-action potential in cardiac muscle, excitation- contraction coupling
 - Explain physiological anatomy of cardiac muscle.
 - Discuss cardiac muscle as syncytium.
2. Cardiac muscle-action potential, excitation- contraction coupling
 - Describe action potential in cardiac muscle.
 - Compare action potential of SA node and ventricular myocardium.
 - Explain excitation- contraction coupling.
3. Cardiac output-intro, formula , factors effecting
 - Define cardiac output.

- Mention formula of cardiac output.
 - Explain factors effecting cardiac output.
4. Cardiac output- end diastolic volume, stroke volume, methods of calculation
 - Discuss end diastolic volume.
 - Explain stroke volume
 - Mention methods of calculation of cardiac output.
 5. Cardiac cycle- events & stages
 - Explain phases of cardiac cycle. (along with graphic presentation)
 - Mention pressure changes in atria & ventricle.
 6. Cardiac cycle-left and right side of heart, aortic pressure curve.
 - Discuss pressure changes on left side of heart.
 - Describe pressure changes on right side of heart.
 - Explain aortic pressure curve.
 7. Cardiac cycle-functions of valves, end diastolic volume, stroke volume
 - Enlist functions of valves.
 - Describe end diastolic volume
 - Discuss stroke volume
 8. Work output of heart- volume pressure diagram, pre-load & after-load
 - Discuss work output of heart.
 - Draw volume pressure diagram.
 - Describe preload & after load.
 9. Regulation of heart pumping-frank-starling mechanism & nervous regulation of heart
 - Discuss Frank-starling mechanism.
 - Describe mechanism of excitation of heart by sympathetic nerve.
 - Explain mechanism of excitation of heart by parasympathetic stimulation.
 10. Regulation of heart pump-effects of potassium & calcium ions, effects of temperature on heart function.
 - Mention effects of potassium & calcium ions on heart functions
 - Explain effects of temperature on heart function.
 11. ECG-normal waves and intervals
 - Describe the normal wave pattern in ECG.
 - Elaborate concept of segments & intervals in ECG.
 - Discuss depolarization waves & repolarization waves.
 - Explain voltages & time calibration of ECG
 12. ECG- abnormal waves & current of injury
 - Understand increase voltage as in cardiac hypertrophy.
 - Enlist decreased voltage cardiac myopathies or in other condition e.g pericardial/ pleural effusion or pulmonary emphysema.
 - Discuss prolonged QRS complex as result of hypertrophy or dilatation, purkinje system block or others
 - Describe current of injury.
 - Explain effect of injury on QRS complex.
 - Elaborate point zero reference potential for analyzing current of injury.
 13. ECG-electrocardiography and electrocardiograph

- Explain electrocardiographic.
 - Understanding of ECG machine & ECG paper characteristics.
14. ECG-leads, Einthoven's triangle
 - Explain Einthoven's triangle & Einthoven's law.
 - Describe mechanism of (augmented) unipolar & bipolar limb leads & chest leads (pericardial leads)
 15. Vector analysis of normal ECG, axis deviation
 - Describe abnormal ventricular condition that causes axis deviation (right & left axis deviation).
 - Explain bundle branch block causes axis deviation.
 16. ECG-effect of electrolyte imbalance
 - Explain ECG changes during hypo & hyper-natremia.
 - Discuss ECG changes during hypo & hyper-kalemia.
 - Describe ECG changes during hypo & hyper-magnesemia.
 - Understand ECG changes during hypo & hyper-calcemia.
 17. Heart sounds and correlation with ECG
 - Discuss heart sounds types
 - Explain relation of heart sounds with ECG.
 - Describe relation of heart sounds with cardiac cycle.
 18. Conducting system -generation of impulse and importance of SA node
 - Discuss SA node & self excitation of SA node.
 - Explain inter-nodal pathway & transmission of cardiac impulse through atria.
 19. Conducting system of heart-pathway and duration
 - Explain AV node + delay of impulse conduction from atria to ventricles.
 - Discuss rapid transmission in Purkinje fibres.
 - Explain transmission of cardiac impulse on ventricle muscle.
 20. Arrhythmias- abnormal sinus rhythm
 - Explain & differentiate between sinus rhythm & abnormal sinus rhythm.
 - Define & explain tachycardia & bradycardia.
 - Discuss vagal stimulation as cause of bradycardia & bradycardia in athletes.
 - Explain sinus arrhythmia.
 21. Arrhythmias- current of injury and sino-atrial block
 - Explain Current of injury.
 - Elaborate clinical significance of sino-atrial block.
 22. Arrhythmias: Atrio-ventricular block
 - Understand atrio-ventricular block (conduction abnormalities).
 - Elaborate causes of AV-block & should have clear concepts regarding different types (degree) of AV block & their treatment.
 - Explain Stokes - Adams syndrome along its significance & treatment.
 23. Arrhythmias- premature contractions
 - Discuss causes of premature contractions.
 - Explain premature atrial contraction & define pulse deficit.
 - Explicate ventricular contraction.
 24. Arrhythmias- atrial fibrillation & flutter
 - Explain atrial fibrillation.

- Elaborate ECG changes during atrial fib.
 - Discuss irregularity of vent. Rhythm during atrial fib.
 - Describe electric shock as treatment of fib. & flutter.
25. Arrhythmias- ventricular fibrillation
- Discuss phenomenon of re-entry “circus movement” as basis of vent. Fibrillation.
 - Elaborate electro shock defibrillation of ventricles.
 - Explain CPR as aid to defibrillation.
26. Angina pectoris & myocardial infarction
- Explain causes & features Angina pectoris.
 - Discuss coronary ischemia & myocardial infarction & ECG changes.
27. Cardiac arrest & failure
- Explain cause of cardiac arrest.
 - Discuss the role of implanted electronic cardiac pace-maker.

CIRCULATION (05 Weeks)

1. Physical characteristics of circulation.
 - Discuss physical characteristics of circulation.
 - Explain basic principle of circulatory function.
 - Inter-relate pressure, flow & resistance.
2. Blood vessels classification & function.
 - Explain blood vessel classification
 - Enlist various function of blood vessels
3. Capillary dynamics & micro circulation.
 - Discuss structure of micro-circulation and capillary system
 - Explain flow of blood in capillaries-vasomotion
 - Describe exchange of water ,nutrients and other substances btw blood and interstitial fluid
 - Define interstitium &interstitial fluid
 - Discuss fluid filtration across capillaries is determined by hydrostatic &colloid osmotic pressure, as well as capillary filtration co –efficient
4. Lymphatic & Edema.
 - Explain lymphatic system (formation of lymph ,rate of lymph flow)
 - Discuss lymph capillary pump
 - Describe role of lymphatic system in controlling interstitial fluid protein concentration, interstitial fluid volume & pressure
 - Elaborate causes & mechanism edema (extracellular & intracellular)
5. Blood flow & hemodynamics & regulation.
 - Discuss local control of blood flow in response to tissue needs
 - Describe mechanism of blood flow control
 - Explain acute control of local blood flow
 - Elaborate acute metabolic control
 - Enlist endothelial-derived relaxing & constricting factors controlling of tissue blood flow
 - Discuss long term blood flow regulation

- Understand vascular control by ions and other chemical factors
6. Control of circulation & vasomotor center.
 - Explain nervous regulation of circulation
 - Describe vasomotor center in brain & its control of vasoconstrictor system/vasodilator system
 - Discuss control of heart activity by vasomotor center
 - Understand control of vasomotor center by higher nervous center
 7. Arterial pulses (normal).
 - Note rate, rhythm volume and character of arterial pulse
 8. Arterial pulses (abnormal).
 - Observe rate ,rhythm volume and character of arterial pulse (abnormal)
 9. Vascular distensibilities varicose vein.
 - Discuss vascular distensibility
 - Describe central venous pressure and peripheral venous pressure
 - Elaborate clinical significance of venous valve incompetence & causes varicose veins
 10. Veins & their function & TPR.
 - Discuss veins (structure, characteristics & functions)
 - Determine TPR & its calculation
 - Enlist factors affecting TPR & its regulation
 11. JVP & its measurement.
 - Discuss significant wave pattern of JVP
 - Enlist methods to measure it
 - Enumerate causes of raised JVP
 12. Venous return & its regulation.
 - Explain venous return curves
 - Co-relate resistance to venous return
 13. Blood pressure: Short term regulation of blood pressure.
 - Discuss arterial blood pressure
 - Mention the role of nervous system in rapid control of blood pressure(circulatory reflex initiated by baro-receptor) & (pressure buffer system of baro-receptor control system)
 14. Blood pressure: Long term regulation of blood pressure.
 - Explain long term regulation of blood pressure
 - Discuss renal-body fluid system for blood pressure control
 - Describe renin-angiotensin system
 15. Heart rate & its regulation, HTN.
 - Discuss heart rate and its regulation by autonomic nervous system
 - Describe HTN (Classification)
 - Enumerate causes of hypertension
 - Describe cardiac output at rest and during activity
 - Explain Frank-starling mechanism
 - Mention role of nervous system in controlling cardiac output
 - Enlist causes of low and high cardiac output and its regulation(cardiac output curves)
 16. Hemorrhage & shock.
 - Elaborate definition ,types & causes of hemorrhage

- (immediate /delayed compensatory effects of hemorrhage)
 - Enlist cause of physiologic / pathologic shock
 - Explain types of shock and their mechanism
 - Discuss physiology of treatment in shock
 - Illustrate clinical significance of circulatory arrest
17. Coronary circulation.
 - Discuss coronary circulation
 18. Regulation of coronary circulation.
 - Explain regulation of coronary circulation
 19. Cerebral circulation.
 - Describe cerebral circulation.
 20. Regulation of cerebral circulation.
 - Understand regulation of cerebral circulation.
 21. Fetal circulation.
 - Discuss fetal circulation
 22. Changes at birth.
 - Elaborate changes at birth
 23. Splanchnic circulation.
 - Explain splanchnic circulation
 24. Capillary circulation.
 - Understand the dynamics of capillary circulation
 25. Skeleton circulation at rest.
 - Explain skeleton circulation at rest
 26. Skeleton circulation during exercise.
 - Describe skeleton circulation during exercise
 27. Cutaneous circulation triple response.
 - Discuss cutaneous circulation & triple response

3rd TERM

Respiration, Varied Environment, Skin and Body Temperature (06 Weeks)

Respiration (04 Weeks)

1. Introduction of resp. muscle +lungs exp +con. Function of respiratory system.
(mechanics-1)
 - Explain physiologic anatomy of respiratory system.
 - Discuss respiratory muscle causing lung expansion & contraction.
 - Describe functions of respiratory system (trachea, bronchi & bronchioles).
2. Mechanics 2 pressure & lung compliance
 - Explain pressure that causes the movement of air in & out of lungs.
 - Discuss pleural pressure & its change during respiration.
 - Describe alveolar pressure & trans-pulmonary pressure.
 - Understand compliance of lung with diagram.

3. Determinants of compliance of theory & lungs
 - Mention determinants of compliance of thorax & lungs.
4. Surfactant, surface tension & work on breathing
 - Discuss principles of surface tension.
 - Describe pressure in occluded alveoli caused by surface tension.
 - Explain surfactant & its effect on surface tension.
 - Mention work of breathing & energy required for respiration.
5. Pulmonary volume & capacities
 - Explain pulmonary volumes & capacities, their values & unit along with graphical presentation.
6. Spirometry & determination max expired flow with curve
 - Discuss pulmonary function test.
 - Mention abbreviations & symbols used
 - Determine functional residual volume & total lung capacity (helium dilution method).
 - Describe minute respiratory volume.
7. Dead – space (cough & sneeze reflex)
 - Define dead space.
 - Mention its effects on alveolar ventilation.
 - Discuss cough reflex.
 - Describe sneeze reflex.
8. Pulmonary circulation of blood flow through lungs
 - Discuss physiologic anatomy of pulmonary circulation.
 - Explain pressures in pulmonary system.
 - Describe blood volumes of lungs.
 - Understand blood flow through lungs & its distribution.
 - Mention effects of hydrostatic pressure gradient in lungs on regional pulmonary blood flow.
9. Pulmonary capillary dynamics of respiratory Unit membrane
 - Discuss pulmonary capillary dynamics.
 - Describe pulmonary capillary pressure.
 - Understand capillary exchange of fluid in lungs & pulmonary interstitial fluid dynamics.
 - Explain negative pulmonary interstitial pressure & mechanism for keeping alveoli dry.
 - Elaborate respiratory unit membrane (physiologic anatomy & diffusion of gases through respiratory membrane, factors that affect functions).
 - Discuss rate of diffusion through respiratory membrane.
10. Laws physics of gas- exchange of diffusion
 - Physics of gas diffusion & gas partial pressure.
 - Molecular basis of gas diffusion.
 - Partial pressure of individual gases.
 - Pressure of gases dissolved in water & tissue.
 - Diffusion of gases through fluids, pressure difference causes net diffusion.
 - Composition of alveolar air & atmospheric air.

11. Alveolar ventilation; comparison of Alveolar air with Atmospheric Air & Expired air
 - Discuss alveolar ventilation.
 - Describe rate of alveolar ventilation.
 - Compare alveolar air with atmospheric air & expired air.
12. Effect of ventilation perfusion ratio on alveolar gas exchange to abnormalities of ratio (laws of Laplace)
 - Mention effects of ventilation perfusion ratio on alveolar gas exchange & abnormalities of ratios.
 - Understand concept of physiologic shunt (when v_A/Q is below normal).
 - Elaborate abnormalities of ventilation-perfusion ratio.
13. Diffusion of CO_2 from peripheral tissue in to capillaries of then in to alveoli.
 - Describe diffusion of CO_2 from periphery to lungs and pressure differences.
 - Mention effects of rate tissue metabolism & tissue blood flow on interstitial PCO_2
14. Diffusion of O_2 from lungs to periphery
 - Explain diffusion of O_2 from lungs to periphery.
 - Mention effects of tissue metabolism and tissue blood flow on interstitial PO_2 .
15. O_2 transport of oxy-hemoglobin curve
 - Discuss transport of oxygen in arterial blood.
 - Describe oxygen-Hb dissociation curve.
 - Mention effects of Hb to buffer tissue PO_2 .
16. Factors shifting the oxy-hemoglobin curve
 - Mention factors shifting the oxy-hemoglobin curve and their importance for oxygen transport.
 - Discuss increase in delivery of O_2 to tissue when O_2 and hydrogen ion shift O_2 -Hb dissociation curve ...THE BOHR EFFECT.
17. CO_2 transport and curve
 - Discuss CO_2 transport in blood.
 - Describe carboxy-Hb & its dissociation curve
 - Explain when O binds with Hb, CO_2 is released (HALDANE EFFECT) to increase CO_2 transport
 - Mention respiratory exchange ratio.
18. Nervous regulation of respiration
 - Discuss respiratory center.
 - Explain dorsal respiratory group of neuron-its control of inspiration & of respiratory rhythm.
 - Define inspiratory ramp signal.
 - Describe how pneumotaxic center limit the duration of inspiration & increase respiratory rate.
 - Enlist ventral group of neurons-functions in both inspiration and expiration.
 - Understand lung inflation signals limit inspiration –THE HERING-BREUER INFLATION REFLEX.
 - Elaborate control of overall respiratory center activity.
19. Chemical regulation of respiration
 - Explain direct chemical control of respiratory center activity by CO_2 & hydrogen ions.

- Discuss peripheral chemoreceptor system for control of respiratory activity –role of oxygen in respiratory control.
20. Regulation of respiration during exercise
- Inter-relate between chemical factors & nervous factors in control of respiration during exercise.
 - Describe neurogenic control of ventilation during exercise may be partially a learned response.
21. Other factors affecting respiration
- Discuss voluntary control of respiration.
 - Mention effects of irritant receptors in airways.
 - Enlist functions of lung J receptor.
 - Understand brain edema depress respiratory center.
 - Elaborate clinical significance in anesthesia.
 - Discuss periodic breathing.
 - Explain basic mechanism of CHEYNE-STOKES breathing.
 - Describe sleep apnea.
22. Hypoxia & ITS types
- Describe hypoxia inadequate tissue capability to use oxygen.
 - Mention effects of hypoxia on body.
 - Discuss oxygen therapy in different types of hypoxia.
23. Hypercapnia, Dysnea
- Mention hypercapnia effects of increase CO₂ on body.
 - Discuss dysnea, causes of dysnea and O₂ therapy.
24. Oxygen toxicity
- Discuss oxygen toxicity
25. Cyanosis & Asphyxia
- Discuss cyanosis.
 - Elaborate clinical significance of asphyxia.

Varied Environment (1.5 Weeks)

26. High altitude & space physiology
- Explain natural acclimatization of native human –living at high altitude.
 - Discuss reduced work capacity at high altitude & positive effect of acclimatization.
 - Explain acute mountain sickness & high altitude pulmonary edema.
 - Discuss chronic mountain sickness.
 - Mention effects of acceleratory forces on body in aviation & space physiology.
27. Deep sea physiology
- Mention effects of high partial pressure of individual gases on body.
 - Describe scuba (self – contained underwater breathing apparatus diving) and decompression sickness (caisson disease).
 - Discuss hyperbaric O₂ therapy.
 - Elaborate nitrogen narcosis.

Skin and Body Temperature (0.5 Week)

