

**DETAILED SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR  
PHYSIOLOGY ( MEDICAL EDUCATION) - TOTAL MARKS : 100**

**1.General Physiology including Genetic Basis .....5MARKS**

Physiology of the cell including genetic control mechanisms  
.Physiological phenomena as hemodynamics,bioelectrical potentials  
.History of Physiology ,Nobel Laurates and discoveries  
Biostatistics,Biochemistry ,Biophysics ,microanatomy  
Growth and Development including Apoptosis, Aging .  
Excretion,PH,water and electrolyte balance  
Principles of Homeostasis  
structure of cell membrane  
Intercellular communications  
Mechanism of transport across the cell membrane  
Body fluid compartments  
Blood volume

**2.Hematology .....5MARKS**

Blood -functions,composition  
Properties-specific gravity,viscosity  
Plasma proteins  
**Red blood cells** -morphology,composition,functions,normal RBC count,variations ,properties

Hemoglobin-structure,functions,normal types,abnormal Hb  
Erythropoiesis-sites(intrauterine,extrauterine),different stages ,factors influencing and regulating erythropoiesis,lifespan of RBC,its destruction ,Jaundice  
Anemias-classification(aetiological and morphological,physiological basis of anemia,types,polycythemia  
Bone marrow study-myeloid and erythroid ratio

**White blood cells**

classification,morphology ,lifespan  
Properties and functions ,normal count,differential count,variations  
leucocytosis,leucopenia,leukemia,agranulocytosis,  
Leucopoiesis

**Immunity**-Definition,Development and regulation of immunity

Innate and acquired,Humoral and cellular  
Mechanism of immune response,plasma cell,immunoglobulins  
Autoimmune disorders,AIDS

**Platelets**-morphology,functions,normal count,variations thrombopoiesis,factors influencing this.

**Reticuloendothelial system**

Hemostasis-Primary,secondary,clot retraction,Anticlotting mechanisms invivo-factors that limit clot formation ,Anticoagulants-invivo,invitro,  
Bleeding disorders-Purpura,Hemophilia,Vitamin Kdeficiency Tests for bleeding disorders-bleeding time,clotting timeprothrombin time,Partial Thromboplastin time.Thrombosis ,Embolism

**Blood Groups**

ABOand Rh systems,inheritance,differences,Bombay Group,Landsteiners law1 and 11 ABO and Rh incompatibility,Erythroblastosis foetalis ,its significance .

**Blood banking and Transfusion**

Blood Transfusion -indications,precautions, complications  
Blood banking-anticoagulants used,storage,changes during storage  
Transfusion of blood components  
Lymph-formation,circulation,functions  
Tissue fluid-formation,circulation,functions ,Starlings hypothesis-oedema

### **3.Cardiovascular system.....15MARKS**

Functional anatomy of heart and blood vessels

**Properties**-morphology,electrical,mechanical and metabolic functions

**Conducting system of Heart**-origin and spread of cardiac impulse,abnormal pacemakers,conduction defects

**Cardiac cycle**-Definition,phases and events of cardiac cycle

Pressure and volume changes in different chambers and vessels

**Heart sounds**-causes,character,murmer,definition,physiological basis

**Arterialpulse**-genesis,character of normal pulse,tracing in plethysmography ,abnormalities

venous blood flow,venous tone,valves

correlation between different events of cardiac cycle

noninvasive investigations-echocardiography,cardiovascular autonomic function

tests-heart rate variability,ambulatory pressure monitoring

effect of headup and head down tilt on blood pressure

measurement of blood flow

**ECG**-Definition ,Principles of recording of ECG,Leads-commonly used ,

Normal tracing in Lead 11-waves,segments,intervals,How HR is determined,clinical uses of ECG

Abnormal ECG pattern in myocardial infarction, cardiac arrhythmias,conduction defects,

first degree ,second degree,complete heart block

Effect of changes in ECF Na,K,Ca.cardiac axis ,correlation with events in cardiac cycle.

**Cardiac output**-Definition,normal values,variations

mention the method of measurement -Ficks principle

Regulation of cardiac output,regulation of heart rate,stroke volume.

#### **Hemodynamics**

Functional organization of Heart and blood vessels

physical laws governing flow of blood in vessels-pressure-resistance,flowralationship ,PoiseuilleHagen formula,Law of Laplace

Laminar flow,turbulent flow,Reynolds number,critical closing volume,

importance of peripheral resistance,venous circulation,venos tone

Regulation of blood flow-local and systemic

#### **Arterial blood pressure**

systolic and diastolic pressure-definition,normal values,variations,Bernoullis principle

define end pressure and lateral pressure,pulse pressure,mean arterialpressure

-normal valuesMeasurement of blood pressure

Regulation -neural and humoral (shortterm,intermediate and long term )

Local and systemic cardiovascular regulatory mechanisms ,autoregulation

Effect of gravity,posture and exercise on BP

Hypertension and Hypotension

#### **Regional circulation-**

coronary,capillary,cerebral,cutaneous,foetal,microcirculation,lymphatics

pulmonary ,renal and splanchnic circulation

**Circulatory shock** -types,pathophysiology,stages,compensatory mechanisms

Pathophysiology of syncope and Heart failure

#### **4.Respiratory system.....15MARKS**

**Introduction**,Functional anatomy of respiratory system

Functions of different parts of respiratory system including

nonrespiratory functions

**Mechanics of respiration** -pressure changes

surfactant

Law of Laplace-application

Measurement of pulmonary ventilation-lung volumes and capacities

Ventilation -pulmonary and alveolar

Dead space -Anatomical and Physiological

stethography-study of respiratory movements and factors affecting

**Pressure volume relationship**-elastic behaviour of lungs,compliance,airway

resistance,work of breathing ,factors affecting bronchial tone

**Pulmonary blood flow**-factors influencing blood flow

ventilation perfusion ratio and its significance

**Pulmonary gas exchange**-composition of inspired air,expired air, partial pressures

**Mechanism of gas exchange**,-blood gas barrier ,factors affecting diffusion across

respiratory membrane,diffusion capacity of O<sub>2</sub>and CO<sub>2</sub>

**O<sub>2</sub> transport in blood** ,Bohr effect

**CO<sub>2</sub> transport in blood** ,Haldane effect

**Regulation of respiration**-neural,chemical,interaction between these chemical

stimuli

**Hypoxia**-definiton,types,clinical features ,treatment

Cyanosis,Asphyxia,Dyspnoea

**Periodic breathing** -chyenestokes,Biots,voluntary hyperventilation

**Environmental Physiology**-High altitude,rapid ascent,mountain

sickness,acclimatization

Effects of UV radiation,dysbarism

Nitrogen narcosis.High pressure nevus syndrome,oxygen toxicity,

Decompression sickness(caissons disease)

**Artificial respiration**,cardiopulmonary resuscitation

**Pulmonary function tests ,space physiology** -effect of Gforces on respiratory

system

respiratory changes during exercise

**Assessment of respiratory functions** -spirometry,vitalography,gas

analysis,measurement of BMR

#### **5.GASTROINTESTINAL SYSTEM.....5MARKS**

General organization ,neural control of G.I functon,enteric nervous system,

mechanism of enzyme secretion of glands

**Salivary glands**-functional anatomy ,

Saliva-composition,functions ,regulation of secretion,conditioned and unconditioned

reflexes

Disturbances in salivary secretion

**Gastric secretion**-functional anatoy of stomeach

Gastric juice-composition,functions

Gastric HCl secretion-mechnaism and regulation of secretion

Gastric juice -composition,functions,phases ,regulation of secretion

Gastrin-functions ,regulation of secretion  
Mucosal barrier,pathophysiology of peptic ulcer

### **Pancreatic secretion -exocrine pancreas**

functional anatomy

pancreatic juice -composition,function ,regulation of secretion-neural  
,hormonal,Applied-steatorrhoea

### **Liver and Gall bladder**

Functions,anatomy.composition and functions of bile ,control of secretion  
functions of gall bladder,filling and emptying of gall bladder  
Enterohepatic circulation,Jaundice-prehepatic,hepatic ,posthepatic

### **Small intestine**

Functional anatomy,composition ,functions of intestinal juice,regulation of secretion

### **Movements of GI Tract**

Electrophysiology of smooth muscle-BER,MMC

Peristalsis-definition,basis,functions

Mastication-definition,muscles involved,functions,regulation

Deglutition-definition,muscles involved,stages,functions,regulation

Gastric motility-types,regulation,abnormal movements(vomiting,Diarrhoea)

Gastric emptying-duration,factors affecting

Movements of small intestine

### **Large intestine**

functions,defecation reflex,role of dietary fibre,bacterial flora

Gastrointestinal hormones

Digestion,and absorption of carbohydrates,proteins,lipids.

## **6.RENAL SYSTEM.....5MARKS**

**Introduction**-functional anatomy,nephron-structure,parts,functions

Renal circulation -normal flow,regulation,peculiarities,

Juxtaglomerular apparatus-site,structure,function

Glomerular filtration-definition,rate,filtration membrane,forces governing filtration  
and permeability of membrane,measurement of GFR,Clearance values-  
definition,values for glucose,inulin,urea

Tubular functions

Juxtaglomerular apparatus-structure and functions

Tubular reabsorption-glucose,sodium,water,urea,electrolytes -sites,mechanism  
involved

water-reabsorption,in different segments-obligatory, facultative

Tubular secretion-H<sup>+</sup>,K<sup>+</sup>,filtered load,tubular maximum,glomerular feedback,renal  
threshold

Acidification of urine-mechanism of H<sup>+</sup>secretion,fate ofH<sup>+</sup>,PH changes along the  
renal tubule

,Acid base balance

Concentration of urine

counter current system-multiplier,exchanger

corticomedullary gradient-factors maintaining (ADH,permeability,of renal tubule,role  
of urea,vasa recta

osmotic gradient along renal tubule

Diuresis -definition,osmotic and pressure diuresis.

Micturition

Functional anatomy of bladder,innervation of bladder,filling and emptying of  
bladder,cystometrogram,micturition reflex,and its higher control,voluntary control

Abnormalities of micturition-deafferented,decentralized,automatic bladder

Urine-Normal volume,constituents,anormal constituents,polyuria,oliguria,anuria  
Dialysis-artificial kidney,renal function tests

## **7.SKIN AND TEMPERATUR REGULATION.....2MARKS**

structure,functions.methods of heat conservation and heat loss in human body  
Regulation of body temperature,role of skin and hypothalamus  
hyperthermia,fever,heat stroke,hypothermia,cold injuries/frost bite

## **8.NERVE MUSCLE PHYSIOLOGY .....3MARKS**

Excitable tissue-definition,

**Neuron**-structure,types,properties,functions

stimulus-definition, types-threshol,subthreshold,suprathreshold

**Nerve fibres**-tpes,classification,functions

Resting membrane potential,nerve action potential

Transmission of nerve impulse ,Peripheral nerve injury

**Neuromuscular junction**,Transmission of impulse across neuromuscular junction

Neuromuscular blocking drugs ,applied clinical aspects

Muscles -classification

**Skeletal muscle** ,structure including molecular details,action potential,

molecular basis of muscle contraction,muscle types -fast and slow

energy sourcesand metabolism in muscle at rest and during muscle contraction

muscular changes during exercise

Length Tension relationship

EMG-fasciculation,fibrillation

**Cardiac muscle** -structure,properties,action potential,pacemaker

potential,mechanism of contraction,LengthTension relationship

**Smooth muscle** -types,structure,innervation,neuromuscular

junction,potential,mechanism of contraction ,plasticity ,Length Tension relationship

## **9.NERVOUS SYSTEM.....25MARKS**

Organisation of nervous system

Functional anatomy of brain and spinal cord

**Brain**-lobes,functions,Broadmanns are

Neuron,neuroglia -functions

**Spinal cord** -functional anatomy

crosssection with location of sensory,motor and autonomic neurons and tracts

**cerebrospinal fluid** -formation,circulation,composition,functions lumbar puncture

**Synapse** -types ,functional anatomy of chemical synapse and synaptic transmission,

synaptic potentials,properties of synapses,synaptic inhibiton

neurotransmitters and neuromodulators

**Reflex action** -definition,reflex arc-components,classification with examples

sensory receptors -clasification,types(phasic and tonic)properties -adaptation

receptor potential,comparison withaction potential

**sensations**-classification

**sensory tracts** -organisation of sensory pathways,tracing of pathways from body and face.

**pain sensation** -details,different types of pain

modulation of pain-spinal level,supraspinal level

visceral pain,referred pain,radiating pain-clinical corelates ,Altered pain sensations

**Thalamus** -functional anatomy,nuclei-classification,connections ,functions ,Thalamic syndrome

**Sensory cortex** -location,primary area,secondary area,association areas,salient histological features,sensory homunculus,lesions

## **MOTOR SYSTEM**

Introduction,levels of motor control

**Reflex action**,reflex arc definition,classification of reflexes with examples stretch reflex,inverse stretch reflex,reciprocal innervation,withdrawal reflex

**Motor cortex**,motor areas ,motor homunculus ,Descending tracts

General organization ,pyramidal and extrapyramidal tracts,their functions uppermotor neurons,their lesions

effect of lesions at various levels-hemiplegia,paraplegia,monoplegia

**Spinal cord injuries** -complete transection,incomplete

transection,hemisection,section of anterior and posterior roots ,injury to motor nerve

**Basal ganglia**-organisation,connections,functions ,disorders

**Cerebellum**-functional anatomy,functions of deep cerebellar nuclei,connections in relation to functions ,cerebellar disorders

**Reticular formation** -ARAS,Descending reticular system-explain control of muscle tone,functions

**Limbic system**-organisation,connections,functions

**EEG and sleep**-Define **EEG**,principle of recording,normal waves,clinical uses

**Vestibular apparatus** -functional anatomy,connections and functions

## **Muscle tone,Posture,Equilibrium**

Basis of maintenance,-stretch reflex,higher control

Postural reflexes with levels of integration

Regulation of muscle tone and posture

**Hypothalamus**-functional anatomy,nuclei,connections,functions

**Higher functions of brain** -Learning,memory,speech

**Autonomic nervous system** -organisation and functions

**Special senses -olfaction**-receptor,pathway,lesions

**Taste** -taste buds,receptor,primary taste sensations ,pathway,lesions

## **Vision**

Functional anatomy,chambers of eye,intraocular fluids

lens-characteristics,changes with age ,aphakia,cataract

Retina-histology,macula lutea,fovea centralis

basic optics ,optical system of eye,refractive media of eye ,concepts of reduced eye ,image formation on retina 'emmetropic eye,far and near points

Accommodation and accommodation reflex(Near response)

Errors of refraction,presbyopia,contact lens

Visual receptors(cones and rods)-structure,visual pigments,role of vitamin A

Phototransduction

Adaptation of visual receptors -Dark adaptation and light adaptation

Electrophysiology of receptors,receptor potential,lateral

inhibition,electroretinogram-Duplicate theory of vision ,photopic and scotopic vision

Muscles of eye,nerve supply,movements of eyeball ,corresponding points ,double vision,squint

Colour vision-primary,secondary and complementary colours hue,brightness and saturation,receptors,Trichromatic and opponent process theories,colour blobs-location and function,colour blindness,afterimages,contrasts

Visual pathway-effect of lesions at different levels

visual signals-processing in retina

Macular sparing

visual cortex,visual reflexes,-pupillary reflexes light(direct and indirect )pathway ,lesions

accommodation reflex pathway,lesions

corneal reflex

Tests of vision-field of vision,-perimetry,accommodation,fundoscopy,visual acuity,colour vision

Neuroelectrodiagnostic techniques -nerve conduction study,VEP(visual evoked potential )

BERA(brainstem auditory evoked potential)SEP(somatosensory evoked potential).MEP (motor evoked potential)

### **AUDITION**

Acoustics-frequency,amplitudeof sound,pitch,intensity and quality of sound

Functional anatomy of ear,functions of external,middle and innerear.

cochlea-structure,organ of corti ,hair cell physiology ,mechanoelectrical transduction by hair cells

endocochlear potential,Determination of pitch(Travelling wave theory )and intensity of sound

Auditory pathway,sound localization,pitch discrimination,masking of sounds

Deafness

Audiometry

## **10.ENDOCRINOLOGY AND REPRODUCTION - 20MARKS**

General-names,organization,

Hormone-definition,and classification,mechanism of action .control of secretion of hormones in general positive feed back and negative feedback ,abnormalities of hormone function ,hormonal assay

### **Hypothalamus**

functional anatomy,hormones,physiological actions,interrelationship between hypothalamusand pituitary glands

Infundibulum-hpothalamopituitary tract and portal system

### **Pituitary gland**

functional anatomy,cell types,hormones of anterior and posterior pituitary

Growth hormone -physiological actionsand regulation of secretion,Hyper and hypofunction

Intermediate lobe hormones -proopiomelanoortin and MSH

**Thyroid gland** -hormones,biosynthesis,transport,physiologicala actions ,regulation of secretion

Thyroid function tests

Hyper and hypofunction in children and adults

Pancreas-endocrine ,functional anatomy,hormones-physiological actions and regulation of secretion.

Hyper and hypofunction

Insulin-receptors,insulin resistance

Glucagon,somatostatin,pancreatic polypeptide

Adrenal gland

Adrenal cortex-functional anatomy,hormones of adrenal cortex,-  
glucocorticoids,mineralocorticoids,sex steroids,biosynthesis,transport,physiological  
actions,regulation of secretion

Hyper and hypofunction

Adrenal medulla

Hormones(catecholamines,regulation of secretion,clinical aspects  
calcium homeostasis-normal calcium metabolism,PTH,calcitonin and vitamin-target  
organsand physiological actions ,hypocalcemiaand tetany

Other endocrine glands

Kidney,Pineal body,Thymus,White adipose tissue,Heart ,endothelium.local hormones  
-sources ad physiological actions

Physiology of growth and development-

### **REPRODUCTIVE SYSTEM**

Introduction,sex organs,genetic basis of sex,sex differentiation and development of  
reproductive system

factors influencing development of genitalia

Aberrant sexual differentiation

chromosomal development

puberty-normal,precocious and delayed puberty

### **MALE REPRODUCTIVE SYSTEM**

Functional anatomy,functions of testis-endocrine,spermatogenesis,abnormalities of  
testicular function

erection,ejaculation,composition of semen,sterility

semen analysis-sperm count,motility and morphology

### **FEMALE REPRODUCTIVE SYSTEM**

Functional anatomy,

ovary-oogenesis,ovulation,corpus luteum

ovarian hormones,control of ovarian functions by H.P.Gonadal axis

Pituitary gonadotropins(FSH,LH)

Menstrual cycle-phases,ovarin,uterine,vaginal changes during menstrual cycle

Hormonal regulation

Abnormalities of ovarian function,menarche,menopause,castration before and after  
puberty

Tests for ovulation-determination of ovulation time by basal body temperature and  
pregnancy diagnostic test-immunological tests

Pregnancy,fertilization,implantation,corpus luteum of pregnancy

Placenta-functions,placental hormones

fetoplacental unit

pregnancy tests

Parturition,-physiology of labour

Lactation-hormones influencing and their actions

contraception-temporary and permanent methods in males and females and their  
physiological basis

**NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.**

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