REGULATIONS AND CURRICULUM GOVERNING

MSc MEDICAL PHYSIOLOGY PROGRAM

(2024-25)

Name of the Constituent Unit/Centre: Yenepoya Medical college



YENEPOYA

Deemed to be University

Deralakatte, Mangalore, Karnataka.

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NOTIFICATION FROM THE UNIVERSITY

YENEPOYA
UNIVERSITY

Office of the Registrar
University Road
P.O. Nithyananda Nagar
Deralakatte
Mangalore - 575018
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Ref: No. YU/REG/ACA/3-ACM/2009 31.10.2009

NOTIFICATION

Sub: Starting of M.Sc. in pre & para clinical departments

Ref: Resolution of the Academic Council at its 3rd meeting held on 31.10.2009 vide agenda - 3

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The Academic Council at its 3rd meeting and subsequently the Board of Management at its 9th meeting held on 31.10.2009 have resolved to approve the proposal to start following M.Sc. in pre & para clinical departments:-

1. M.Sc Medical Anatomy
2. M.Sc Medical Physiology
3. M.Sc Medical Biochemistry
4. M.Sc Medical Pharmacology
5. M.Sc Medical Microbiology

This notification is issued for implementation with effect from the academic year 2010-2011.

I/c REGISTRAR
Registrar
YENEPOYA
(Deemed to be University)

To:

The Principal - YMC

Copy to:

1. Controller of Examinations
2. File copy

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M.Sc. Medical Physiology

Introduction:

Preamble

The prime concern of the Institute is to develop patterns of teaching in postgraduate medical education so as to demonstrate a high standard of medical education to all medical colleges and other allied institutions globally. This educational experience is imparted in an atmosphere of research.

Goals:

The goal of M.Sc. (Medical) degree course education shall be to produce a competent medical teacher and researcher who is capable of the following.

1. Recognize the learning needs of the Medical, Dental and allied health science students.
2. Mastered most of the competencies pertaining to the specialty that is required to be practiced by training and research.
3. Create an awareness of contemporary advances and developments in the discipline concerned.
4. Build up a spirit of scientific enquiry and an orientation to the Principles of Basic Skills required in Teaching of Medical, Dental and Paramedical professionals.
5. An orientation to the Principles of Research Methodology.

A post graduate student having qualified for the M.Sc. (Physiology) examination should be able to:

PO1 Understand and deal with all aspects of general, systemic and applied Physiology.

PO2 Teach effectively the basic physiological mechanisms of human body with reference to their implications in the pathogenesis of diseases (pathophysiology) affecting various organ systems and the physiological basis of their management to undergraduate medical, paramedical and all other basic science students

PO3 Understand general principles of medical education (use of appropriate teaching

techniques and resources).

PO4 Interpret and evaluate research publications critically

PO5 Use the library facilities (Literature database using computer, CD ROM, internet search and any other available newer techniques).

PO6 Conduct and interpret relevant experimental research which may have significant bearing on human health and patient care

PO7 Acquire skills in conducting collaborative research in the field of physiology with allied sciences, clinical sciences and biomedical engineering

PO8 Function as a member of a teaching or research team.

Criteria (Eligibility): For Admission To M.Sc. Medical

Criteria for admission:

The candidates must have passed B.Sc. with 50% marks and with one subject of Biological Sciences/BAMS/BHMS/BPT or B. Pharm or any other professional graduates from a recognized University in India. (*as amended at the 7th Academic Council Meeting, Agenda No.16)*

Duration of Program:

The M.Sc. Medical Physiology program is a three-year course of study. The first year is dedicated to the M.Sc. Preliminary phase, which covers basic science subjects including Anatomy, Physiology, and Biochemistry. The subsequent second and third years constitute the M.Sc. Medical portion of the degree, focusing on advanced specialty training.

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M.Sc. Preliminary

COURSE CONTENT IN PHYSIOLOGY

Theory

Topic	Hours Allotted
General Physiology • Structure and functions of a mammalian cell • Homeostasis • Intercellular communication • Apoptosis • Transport mechanisms across cell membranes • Fluid compartments of the body • pH & Buffer systems in the body • Evaluation of functions of the cells and products in clinical care and research	6 hrs
Hematology • Components of blood: formation, regulation and functions plasma proteins – origin, types, variations and functions, its clinical implications • Hemoglobin- physiological structure, synthesis, variants and its clinical significant, functions and its breakdown • Erythropoiesis and its regulation in physiological and pathological situations • Anemia, Polycythemia and jaundice and physiological principles of management • Formation of WBC (Leucopoiesis), structure and functions of various WBC types and regulatory mechanism • Immunity – types, development, regulation, physiological significance	14 hrs

• Platelets – formation (thrombopoiesis), structure, function and variations. • Hemostasis: mechanism, & disorders • Anticoagulants • Blood groups, blood banking and transfusion • ESR, PCV	
Nerve & Muscle Physiology • Neuron and neuroglia: structures, types, functions. • Resting membrane potential • Action potential in nerve, skeletal & smooth muscle • Nerve fibres: classification, functions & properties • Nerve injuries, degeneration and regeneration in peripheral nerve • Neuromuscular junction: structure, transmission of impulses, neuro-muscular blocking agents, Myasthenia gravis • Muscle fibres: structure, types & functions • Muscle contraction: molecular basis (skeletal, smooth), • Isotonic vs Isometric, Energy sources and metabolism, gradation of muscle activity • Muscle dystrophy, Myopathies • Strength-duration curve	7 hrs
Gastrointestinal Physiology • Functional anatomy and broad functions of digestive system, enteric nervous system • I Secretions- composition, mechanism of secretion, functions and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion • I movements- types, regulation, functions, reflexes	10 hrs

• ole of dietary fibres • igestion and absorption of nutrients • I hormones- source, regulation, functions • ut-brain axis • tructure and functions of liver and gall bladder • astric function tests, pancreatic exocrine function tests & liver function tests • athophysiology - Achalasia cardia, peptic ulcer, gastro oesophageal reflux disease, vomiting diarrhoea, constipation, Adynamic ileus, Hirschsprung's disease	
Cardiovascular Physiology • Functional anatomy of heart • Pacemaker tissue and conducting system- generation, conduction of cardiac impulse • Properties of cardiac muscle • Cardiac cycle • ECG- recording, normal ECG, uses, cardiac axis, abnormal ECG in common arrhythmias, changes with hypertrophy & MI • Hemodynamics • Heart rate- factors affecting, regulation • Cardiac output- factors, regulation, measurement • Blood pressure- components, determinants, factors, regulation and applied aspect	20 hrs

• Regional circulation- autoregulation, microcirculation, lymphatic circulation, coronary, cerebral, capillary, skin, foetal, pulmonary and splanchnic circulation • Pathophysiology: shock, syncope, heart failure & coronary artery disease	
Respiratory Physiology • Functional anatomy of respiratory tract, dead space • Mechanics of respiration • Pressure volume changes during ventilation • Lung volume and capacities • Alveolar surface tension • Compliance • Airway resistance • Alveolar ventilation, V/P ratio • Diffusion capacity of lungs • Transport of respiratory gases- Oxygen and Carbon dioxide • Neural and chemical regulation of respiration • Physiology of high altitude and deep-sea diving • Principles of artificial respiration, oxygen therapy • Pathophysiology of dyspnoea, hypoxia, cyanosis, asphyxia, drowning, periodic breathing • Lung function tests & its clinical significance	13 hrs
Renal Physiology • Structure and functions of kidney & juxta glomerular apparatus, role of renin-angiotensin system • Renal blood flow • Mechanism of urine formation, concentration and diluting mechanism • Concept and significance of 'clearance' tests; Renal regulation of fluid and electrolytes & acid-base balance	8 hrs

• Structure and innervation of urinary bladder, physiology of micturition, cystometry, and its abnormalities • Artificial kidney (dialysis) and renal transplantation • Renal Function Tests	
Endocrine Physiology • Mechanism of action of steroid, protein and amine hormones • Synthesis, secretion, transport, physiological actions, regulation and effect of altered (hypo and hyper) secretion of pi tuitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas and hypothalamus • Physiology of bone and calcium metabolism • Physiology of growth • Physiology of Thymus & Pineal Gland • Hormone function tests • Obesity & metabolic syndrome • Stress response	13 hrs
Reproductive Physiology • Sex determination, Sex differentiation and their abnormalities • Puberty: onset, progression, stages • Early and delayed puberty • Male reproductive system: functions of testis, spermatogenesis and its regulation, cryptorchidism • Female reproductive system functions of ovary and its control, menstrual cycle: Hormonal, uterine and ovarian changes • Tests for ovulation • Physiological effects and regulation of sex hormones • Contraceptive methods for male and female • Effects of removal of gonads on physiological functions • Physiology of pregnancy, fetoplacental unit, pregnancy tests,	6 hrs

parturition & lactation • Causes and principles of management (IVF) of infertility • Hormonal changes and their effects during perimenopause and menopause	
Central Nervous System • Organization of nervous system • Sensory system: types, functions and properties of synapse, receptors, reflex • Somatic sensations & sensory tracts • Physiology of pain • Motor system: organization, motor tracts, mechanism of maintenance of tone, control of voluntary movements • Posture and equilibrium & vestibular apparatus • Reticular activating system • Autonomic nervous system • Spinal cord: functional organization and lesions • Formation, circulation and function of CSF • Blood brain barrier • Neurotransmitters • Organization, connections and functions of cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system and their abnormalities • Higher mental functions • Physiology of sleep, memory, learning and speech and • their disorders, EEG	25 hrs
Special senses • Smell and taste sensation and their abnormalities • Functional anatomy of ear and auditory pathways & physiology of hearing, Deafness, hearing tests	8 hrs

• Functional anatomy of eye, Image formation, Visual pathway and its lesions, Physiology of vision including acuity of vision, colour vision, field of vision, refractive errors, physiology of pupil, light reflex, accommodation reflex, dark and light adaptation • Auditory & visual evoked potentials	

SCHEME OF TEACHING HOURS FOR THEORY AND PRACTICALS

Topics	Hours
Didactic Lectures	130
SGT/ Seminar/ Discussion/ SDL/ Tutorial	320
TOTAL	450

SCHEME OF EXAMINATION FOR M.Sc. PRELIMINARY

FORMATIVE ASSESSMENT (Internal Assessment):

THEORY			
Type of Questions	**I IA**	**II IA**	**III IA**
Long essay	1 x 10 = 10	1 x 10 = 10	1 x 10 = 10
Short essay	6 x 5 = 30	6 x 5 = 30	6 x 5 = 30
Short Answers	5 x 2 = 10	5 x 2 = 10	5 x 2 = 10
Total theory marks	**50 Marks**	**50 Marks**	**50 Marks**

Calculation of Final Internal Assessment Marks:

Average of the best two Internal Assessment marks will be considered as the final internal assessment. It will be converted to 20 marks. Final internal assessment theory marks in Physiology will be 20 marks.

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SUMMATIVE ASSESSMENT (University Examination):

The preliminary examinations shall be taken at the end of First year.

ELIGIBILITY TO APPEAR FOR UNIVERSITY EXAMINATIONS

1. Candidates must secure a minimum of 50% in internal assessments in theory to be eligible to appear for the University Physiology Theory Examination.
2. A minimum of 75% attendance in Theory is mandatory for appearing in the University Physiology Theory Examinations.

THEORY EXAM PATTERN:

University Theory Examination	
Type of Questions	**Marks**
Long essay	2 x 10 = 20
Short essay	8 x 5 = 40
Short Answers	10 x 2 = 20
Total Theory marks	**80 Marks**

Marks distribution for theory question paper:

Topics	**Marks Allocated Maximum Marks 80 (Suggested)**
General Physiology	4
Hematology	7
Cardiovascular Physiology	10
Respiratory Physiology	10
Gastrointestinal Physiology	7
Renal Physiology	5
Nerve and muscle Physiology	5
Endocrine physiology	10

Reproductive physiology	5
Central Nervous System	12
Special senses	5
Total Marks	**80**

Theory marks of University Examination:

Assessment Category	Details	Marks
Final Examination	Theory Paper (3-hour duration)	80 marks
Internal Assessment	Continuous Evaluation	20 marks
Total		**100 marks**

PRACTICAL:

There will be no practical examinations for the Preliminary M.Sc. Medical Physiology.

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SUGGESTED BOOKS

Suggested Textbooks

1. Guyton and Hall Textbook of Medical Physiology.
2. Ganong's Review of Medical Physiology
3. Textbook of Medical Physiology, Indu Khurana.
4. Textbook of Medical Physiology, G K Pal.
5. Essentials of Medical Physiology, K Sembulingam.
6. Textbook of Medical Physiology, A K Jain.

Reference books for Theory:

1. Vander's Human Physiology.
2. Berne and Levy Physiology, BM Koeppen, BA Stanton.
3. Human Physiology, Lauralee Sherwood.
4. Principles of Medical Physiology, Sabyasachi Sircar.

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FINAL M.Sc. (MEDICAL)

AIMS AND OBJECTIVES:

1. A thorough knowledge of Medical Undergraduate syllabus in the subject by conducting tutorials, practicals for small group students
2. Self-study from standard textbooks
3. Prepare seminars on topics suggested by the HOD and present the same to the faculty members
4. Presenting Journal Clubs for updating the recent advances
5. Referring to old books/journals for history the subject
6. Learn to handle all equipment in the department both routine and sophisticated
7. Learn to use Audio-Visual Aids, Power points for teaching purposes
8. Learn to record and interpret
9. Perform all undergraduate practicals and demonstrations
10. Maintain Practical Record

DISSERTATION:

Candidates must submit a dissertation synopsis, approved by their faculty guide, to the Scientific Review Board and the Institutional Ethics Committee for clearance. Subsequently, one copy of the final dissertation must be submitted to both the University and the Department no later than three months prior to the commencement of the final examinations.

COURSE CONTENT IN PHYSIOLOGY

Theory

General Physiology

- Structure and functions of a mammalian cell
- Homeostasis
- Intercellular communication
- Apoptosis
- Transport mechanisms across cell membranes
- Fluid compartments of the body
- pH & Buffer systems in the body
- Evaluation of functions of the cells and products in clinical care and research

Hematology

- Components of blood: formation, regulation and functions plasma proteins – origin, types, variations and functions, its clinical implications
- Hemoglobin- physiological structure, synthesis, variants and its clinical significant, functions and its breakdown
- Erythropoiesis and its regulation in physiological and pathological situations
- Anemia, Polycythemia and jaundice and physiological principles of management
- Formation of WBC (Leucopoiesis), structure and functions of various WBC types and regulatory mechanism
- Immunity – types, development, regulation, physiological significance
- Platelets – formation (thrombopoiesis), structure, function and variations.
- Hemostasis: mechanism, & disorders
- Anticoagulants
- Blood groups, blood banking and transfusion
- ESR, PCV

Nerve & Muscle Physiology

- Neuron and neuroglia: structures, types, functions.
- Resting membrane potential
- Action potential in nerve, skeletal & smooth muscle
- Nerve fibres: classification, functions & properties
- Nerve injuries, degeneration and regeneration in peripheral nerve
- Neuromuscular junction: structure, transmission of impulses, neuro-muscular blocking agents, Myasthenia gravis
- Muscle fibres: structure, types & functions
- Muscle contraction: molecular basis (skeletal, smooth),
- Isotonic vs Isometric, Energy sources and metabolism, gradation of muscle activity
- Muscle dystrophy, Myopathies
- Strength-duration curve

Gastrointestinal Physiology

- Functional anatomy and broad functions of digestive system, enteric nervous system
- GI Secretions- composition, mechanism of secretion, functions and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion
- GI movements- types, regulation, functions, reflexes
- Role of dietary fibres
- Digestion and absorption of nutrients
- GI hormones- source, regulation, functions
- Gut-brain axis

- Structure and functions of liver and gall bladder
- Gastric function tests, pancreatic exocrine function tests & liver function tests
- Pathophysiology - Achalasia cardia, peptic ulcer, gastro oesophageal reflux disease, vomiting diarrhoea, constipation, Adynamic ileus, Hirschsprung's disease

Cardiovascular Physiology

- Functional anatomy of heart
- Pacemaker tissue and conducting system-generation, conduction of cardiac impulse
- Properties of cardiac muscle
- Cardiac cycle
- ECG- recording, normal ECG, uses, cardiac axis, abnormal ECG in common arrhythmias, changes with hypertrophy & MI
- Hemodynamics
- Heart rate- factors affecting, regulation
- Cardiac output- factors, regulation, measurement
- Blood pressure- components, determinants, factors, regulation and applied aspect
- Regional circulation- autoregulation, microcirculation, lymphatic circulation, coronary, cerebral, capillary, skin, foetal, pulmonary and splanchnic circulation
- Pathophysiology: shock, syncope, heart failure & coronary artery disease

Respiratory Physiology

- Functional anatomy of respiratory tract, dead space
- Mechanics of respiration

- Pressure volume changes during ventilation
- Lung volume and capacities
- Alveolar surface tension
- Compliance
- Airway resistance
- Alveolar ventilation, V/P ratio
- Diffusion capacity of lungs
- Transport of respiratory gases- Oxygen and Carbon dioxide
- Neural and chemical regulation of respiration
- Physiology of high altitude and deep-sea diving
- Principles of artificial respiration, oxygen therapy
- Pathophysiology of dyspnoea, hypoxia, cyanosis, asphyxia, drowning, periodic breathing
- Lung function tests & its clinical significance

Renal Physiology

- Structure and functions of kidney & juxta glomerular apparatus, role of renin-angiotensin system
- Renal blood flow
- Mechanism of urine formation, concentration and diluting mechanism
- Concept and significance of 'clearance' tests; Renal regulation of fluid and electrolytes & acid-base balance
- Structure and innervation of urinary bladder, physiology of micturition, cystometry, and its abnormalities
- Artificial kidney (dialysis) and renal transplantation
- Renal Function Tests

Endocrine Physiology

- Mechanism of action of steroid, protein and amine hormones

- Synthesis, secretion, transport, physiological actions, regulation and effect of altered (hypo and hyper) secretion of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas and hypothalamus
- Physiology of bone and calcium metabolism
- Physiology of growth
- Physiology of Thymus & Pineal Gland
- Hormone function tests
- Obesity & metabolic syndrome
- Stress response

Reproductive Physiology

- Sex determination, Sex differentiation and their abnormalities
- Puberty: onset, progression, stages
- Early and delayed puberty
- Male reproductive system: functions of testis, spermatogenesis and its regulation, cryptorchidism
- Female reproductive system functions of ovary and its control, menstrual cycle: Hormonal, uterine and ovarian changes
- Tests for ovulation
- Physiological effects and regulation of sex hormones
- Contraceptive methods for male and female
- Effects of removal of gonads on physiological functions
- Physiology of pregnancy, fetoplacental unit, pregnancy tests, parturition & lactation
- Causes and principles of management (IVF) of infertility
- Hormonal changes and their effects during perimenopause and menopause

Central Nervous System

- Organization of nervous system
- Sensory system: types, functions and properties of synapse, receptors, reflex

- Somatic sensations & sensory tracts
- Physiology of pain
- Motor system: organization, motor tracts, mechanism of maintenance of tone, control of voluntary movements
- Posture and equilibrium & vestibular apparatus
- Reticular activating system
- Autonomic nervous system
- Spinal cord: functional organization and lesions
- Formation, circulation and function of CSF
- Blood brain barrier
- Neurotransmitters
- Organization, connections and functions of cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system and their abnormalities
- Higher mental functions
- Physiology of sleep, memory, learning and speech and
- their disorders, EEG

Special senses

- Smell and taste sensation and their abnormalities
- Functional anatomy of ear and auditory pathways & physiology of hearing, Deafness, hearing tests
- Functional anatomy of eye, Image formation, Visual pathway and its lesions, Physiology of vision including acuity of vision, colour vision, field of vision, refractive errors, physiology of pupil, light reflex, accommodation reflex, dark and light adaptation
- Auditory & visual evoked potentials

PRACTICALS

The student should acquire competencies in the following experiments:

i) Blood Experiment

- Preparation and examination of peripheral blood smear and determination of differential leucocyte count.
- Determination of red blood cell count
- Determination of total leucocyte count
- Determination of erythrocyte sedimentation rate, packed cell volume
- Determination of hemoglobin concentration of blood
- Calculation of blood indices
- Determination of ABO and Rh blood groups
- Determination of bleeding time, clotting time

ii) Human Experiments

- Study of Fatigue, Mosso's Ergography
- Recoding BP, effect of Posture and exercise
- Spirometry
- PFT (Computerized spirometer)
- Peak Expiratory Flow Rate (PEFR)
- Perimetry (Visual Field)
- ECG in lead II
- Test of Autonomic Functions
- BLS

iii) Clinical Examination

- Examination of Radial pulse,
- Clinical examination of CVS
- Clinical examination of Respiratory System
- Examination of cranial nerves
- Examination of sensory system
- Examination of motor system

❖ Examination of reflex.

iv) Interpretation of Charts, Problems and Case Histories

The questions here will be taken from the theory and practical syllabus.

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SCHEME OF EXAMINATION FOR FINAL M.Sc.

FORMATIVE ASSESSMENT (Internal Assessment):

1. Monthly written test
2. Seminar presentation
3. Journal Club presentation
4. Group discussion
5. Small Group Teaching
6. Model Theory and Practical Examination
7. Skill assessment/ certification

THEORY			
Type of Questions	**I IA**	**II IA**	**III IA**
Long essay	2 x 20 = 40	2 x 20 = 40	2 x 20 = 40
Short essay	6 x 10 = 60	6 x 10 = 60	6 x 10 = 60
Total theory marks	**100 Marks**	**100 Marks**	**100 Marks**
Final Internal Assessment Theory - 25 Marks			
PRACTICALS			
	I IA	**II IA**	**III IA**
Practical Experiments	**50**	**50**	**50**
Final Internal Assessment Practical - 25 Marks			

Calculation of Final Internal Assessment Marks:

Average of the three Internal Assessment marks will be considered as the final internal assessment. It will be converted to 25 marks. The internal assessment marks in Physiology will be out of 25 marks for theory and practical.

Final Practical and Viva Voce University Examination:

Internal Examiner: 2

SUMMATIVE ASSESSMENT (University Examination):

Eligibility to appear in University Examinations:

1. Candidates must secure a minimum of 50% in the internal assessment (Theory and Practical) to be eligible for the University Physiology examination.
2. A minimum of 80% attendance in both Theory and Practical is mandatory for appearing in the University Physiology examinations.

University Exam Question Paper Pattern And Marks Distribution:

THEORY		**Total Marks**
Written Exam Long essay question 2x20 = 40 Marks Short essay question 6x10 = 60 Marks	Paper I - 100 Marks Paper II - 100 Marks Paper II - 100 Marks	300
Theory viva	50 Marks	50
Theory Internal Assessment marks	25 Marks	25
Total		**375 Marks**
PRACTICAL		
Practical exam	100 Marks	100
Practical Internal Assessment marks	25 Marks	25
Total		**125 Marks**
Total marks of Theory and practical		**500 Marks**

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Marks distribution for theory question paper

Three Question Papers of 3 hours duration, each paper will be of 100 marks

Paper 1 (Maximum Marks 100)	
Topics	**Marks Allocated**
General Physiology	10 Marks
Blood	20 Marks
Cardiovascular system	50 Marks
Renal, skin & body temperature regulation	20 Marks
Total	**100 Marks**

Paper II (Maximum Marks 100)	
Topics	**Marks Allocated**
Nervous system	50 Marks
Muscle nerve physiology	10 Marks
Special senses	20 Marks
Respiration	20 Marks
Total	**100 Marks**

Paper III (Maximum Marks 100)	
Topics	**Marks Allocated**
Endocrine	50 marks
Reproduction & family planning	20 marks
Gastrointestinal tract	20 marks
Recent advances in physiology	10 marks
Total	**100 Marks**

SUGGESTED REFERENCE TEXTBOOKS THEORY, PRACTICAL AND JOURNALS

1. Samson Wright's Applied Physiology-13th ed
2. Best & Taylor, Physiological basis of Medical Practice- 12th Ed
3. Guyton and Hall Textbook of Medical Physiology.
4. Ganong, Review of Medical Physiology
5. Campbell, Clinical Physiology
6. Wintrobe's clinical Hematology/12th ed/vol.1 by John P. Greer
7. Renal physiology /4th ed, Bruce M. Koeppen
8. Berne and Levy Physiology, BM Koeppen, BA Stanton
9. William's text book of Endocrinology-9th- Wilson
10. Harrison's principles of internal medicine/18th ed /vol.2, Longo, Fauci , Kasper, Hauser, Jameson , loscaizo.
11. Cellular Physiology and Neurophysiology /2nd ed, Mordecai P. Blaustein
12. West's Respiratory Physiology 10th ed, John B West
13. Neurophysiology A conceptual approach 5th ed, Roger Carpenter and Benijamin Reddi
14. Gastrointestinal Physiology/ 7th ed., Leonard R. Johnson
15. Fundamental Human Neurophysiology, Amarnath B Solepure
16. Clinical Electrophysiology: A handbook for Neurologist, Peter W Kaplan
17. Textbook of Medical Physiology, Indu Khurana.
18. Textbook of Medical Physiology, G K Pal.
19. Essentials of Medical Physiology, K Sembulingam.
20. Textbook of Medical Physiology, A K Jain.
21. Textbook of Practical Physiology, GK Pal and Pravati Pal
22. Physiology Practical Manual, Rashmi Ramanathan
23. Vander's Human Physiology.
24. Human Physiology, Lauralee Sherwood.
25. Principles of Medical Physiology, Sabyasachi Sircar

26. McLeod's Clinical Examination
27. Hutchison's Clinical Methods

Journals

1. Physiology (News in Physiological Sciences)
2. International Journal of Yoga
3. Indian Journal of Physiology and pharmacology

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ANNEXURE: M.Sc. Preliminary

Marks distribution for theory question paper:

Topics	**Marks Allocated Maximum Marks 80 (Suggested)**
General Physiology	4
Hematology	7
Cardiovascular Physiology	10
Respiratory Physiology	10
Gastrointestinal Physiology	7
Renal Physiology	5
Nerve and muscle Physiology	5
Endocrine physiology	10
Reproductive physiology	5
Central Nervous System	12
Special senses	5
Total Marks	**80**

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MODEL QUESTION PAPER

YENEPOYA (DEEMED TO BE UNIVERSITY) M.SC PRELIMINARY MEDICAL DEGREE EXAMINATION AUGUST 2024 SESSION

HUMAN PHYSIOLOGY

Time: 3 Hrs **Max Marks: 80**

Your answers should be specific to the questions asked. Draw neat, labelled diagrams wherever necessary.

LONG ESSAYS **(2x10-20Marks)**

1. Explain the stages of erythropoiesis. List the factors affecting erythropoiesis. Add a note on megaloblastic anaemia. (6+2+2)
2. Name the hormones secreted by thyroid gland. Explain functions of thyroid hormones. Add a note on hypothyroidism. (1+6+3)

SHORT ESSAYS **(8x5=40Marks)**

3. Explain the mechanism of impulse transmission across neuromuscular junction.
4. Define GFR. Write its normal value. Explain the factors effecting GFR(1+1+3)
5. Describe the movements of small intestine.
6. Define homeostasis. Explain feedback mechanisms with example (1+4)
7. Mention the source, composition and functions of surfactant. (1+1+3)
8. Discuss the clinical features of Brown-Sequard syndrome.
9. Explain the compensatory changes which occur during hypovolemic shock.
10. Explain ovarian changes during the menstrual cycle.

SHORT ANSWERS **(10x2-20Marks)**

11. Write two features of mismatched transfusion.
12. Explain any two properties of synapse?
13. Describe the cause and features of steatorrhea.
14. List the functions of middle ear.
15. What is "Fight or Flight" response?
16. What is the function of HCl in stomach?
17. What are the hematological changes that occur during pregnancy.

18. Draw a labelled diagram of lead II ECG.
19. Define functional residual capacity. Write its normal value.
20. Write two functions of hypothalamus.

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ANNEXURE: Final M.Sc. Medical Physiology

Marks distribution for theory question paper

Three Question Papers of 3 hours duration, each paper will be of 100 marks

Paper 1 (Maximum Marks 100)	
Topics	**Marks Allocated**
General Physiology	10 Marks
Blood	20 Marks
Cardiovascular system	50 Marks
Renal, skin & body temperature regulation	20 Marks
Total	**100 Marks**

Paper II (Maximum Marks 100)	
Topics	**Marks Allocated**
Nervous system	50 Marks
Muscle nerve physiology	10 Marks
Special senses	20 Marks
Respiration	20 Marks
Total	**100 Marks**

Paper III (Maximum Marks 100)	
Topics	**Marks Allocated**
Endocrine	50 marks
Reproduction & family planning	20 marks
Gastrointestinal tract	20 marks
Recent advances in physiology	10 marks
Total	**100 Marks**

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MODEL QUESTION PAPER

YENEPOYA (DEEMED TO BE UNIVERSITY)

FINAL M.SC MEDICAL DEGREE EXAMINATION SESSION

HUMAN PHYSIOLOGY-PAPER-I

Time: 3 Hrs **Max Marks: 100**

Your answers should be specific to the questions asked. Draw neat, labelled diagrams wherever necessary.

LONG ESSAYS **(2x20=40Marks)**

1. Describe the properties of cardiac muscle.
2. Describe the functions of cellular components of blood.

SHORT ESSAYS **(6x10=60Marks)**

3. Describe the relation between pressure, flow and resistance in hemodynamics.
4. Define Glomerular Filtration Rate (GFR). Describe the factors regulating GFR.
5. Draw a neat, labelled diagram of conducting system of the heart and trace the spread of excitation. Explain the causes and significance of AV nodal delay.
6. Define homeostasis. Explain positive and negative feedback mechanisms with an example for each.
7. Compare & contrast Ventricular action potential & pacemaker potential.
8. Explain the mechanism involved in concentration of urine.

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FINAL M.SC MEDICAL DEGREE EXAMINATION SESSION

HUMAN PHYSIOLOGY-PAPER-II

Time: 3 Hrs **Max Marks: 100**

Your answers should be specific to the questions asked. Draw neat, labelled diagrams wherever necessary.

LONG ESSAYS **(2x20=40Marks)**

1. Define sensory receptor. Describe the properties of sensory receptor.
2. Name the muscles of respiration. Describe the role of these muscles in mechanics of respiration.

SHORT ESSAYS **(6x10=60Marks)**

3. Draw a neat labelled diagram of neuromuscular junction. With the help of a flow chart explain the steps of transmission of impulse across neuromuscular transmission.
4. Draw a neat labelled diagram of taste bud. Trace the taste pathway and explain the mechanism of taste perception
5. Define Referred pain. Explain the theories of referred pain with examples.
6. Describe the features of upper motor neuron lesion and explain the physiological basis for the features seen.
7. Describe the role of hypothalamus in temperature regulation.
8. Draw neat, labelled diagram of photoreceptors. Explain the mechanism of photo transduction.

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FINAL M.SC MEDICAL DEGREE EXAMINATION SESSION

HUMAN PHYSIOLOGY-PAPER-III

Time: 3 Hrs **Max Marks: 100**

Your answers should be specific to the questions asked. Draw neat, labelled diagrams wherever necessary.

LONG ESSAYS **(2x20=40Marks)**

1. Describe the functions of thyroxine. Explain the cause and clinical features of myxoedema.
2. Describe the secretory and motility functions of stomach.

SHORT ESSAYS **(6x10=60Marks)**

3. Name the hormones of the adrenal medulla. Explain the role of these hormones on cardiovascular system and metabolism.
4. Describe the stages of spermatogenesis. Explain the factors regulating spermatogenesis. Mention normal sperm count.
5. Describe the functions of aldosterone. Explain the factors regulating secretion of aldosterone.
6. Explain the functions of growth hormone. Compare and contrast pituitary dwarf and thyroid dwarf
7. Define ovulation. Describe the tests for ovulation.
8. Describe the role of yoga in cardiorespiratory and metabolic health.

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Feedback for Journal club
YENEPOYA MEDICAL COLLEGE
Department of Physiology
EVALUATION SHEET FOR POSTGRADUATE
JOURNAL CLUB
(To be marked by the Moderator)

Name of the Postgraduate: .....

Name of the Moderator: ..... Date:

.....

Sl. No.	Criteria to be assessed	Score		
		Below par (1)	At par (2)	Above par (3
1	Relevance of article chosen			
2	Identifies the problem addressed in the paper			
3	Completeness of presentation			
4	Analyses and gives comments on methodology and statistics			
5	Brief summary of results			
6	Merits and demerits of the paper			
7	Time management			
8	Relevant answers to questions			
9	Attitude during presentation and confidence			
	Total score:			
Signature of the Moderator:				

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Feedback for Seminar
YENEPOYA MEDICAL COLLEGE
Department of Physiology
EVALUATION SHEET FOR POSTGRADUATE SEMINAR
(To be marked by the Moderator)

Name of the Postgraduate: .....

Name of the Moderator: ..... Date: .....

Topic: .....

Sl. No.	Criteria to be assessed	Score		
		Below par (1)	At par (2)	Above par (3)
1	Set Induction			
2	Introduction of subject and its importance / Objectives			
3	Completeness of presentation			
4	Clarity of presentation			
5	Consulted all relevant literature			
6	Use of audio-visual aids			
7	Understanding of subject			
8	Summary and take-home message			
9	Cites appropriate references / suggests further reading			
10	Time management			
11	Relevant answers to questions			
12	Overall performance – Attitude during presentation and confidence			
	Total score:			
Signature of the Moderator:				

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Hematology-OSPE

Focus the RBC counting squares in the given Neubauer's chamber. **(4 Marks)**

Sl. No	**Student does the following**	**Max. marks**	**Reg.No**											
1	Turns on the microscope light	0.5												
2	Slightly raises the condenser	1												
3	Partially open the iris diaphragm	1												
4	Place the slide on the stage of the microscope	0.5												
5	Bring the high power objective into position	0.5												
6	Make coarse adjustments to focus the image	2												
7	Use the fine adjustment screw for final focusing	2												
8	Adjust the mechanical stage and focus the RBC counting squares	2												
9	Turns off the microscope light	0.5												
	Total	**10**												
	Converted to	**4**												

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Hematology-OSPE

Focus the WBC counting squares in the given Neubauer's chamber. **(4 Marks)**

Sl. No	**Student does the following**	**Max. marks**	**Reg.No**											
1	Turns on the microscope light	0.5												
2	Slightly lower the condenser	1												
3	Slightly open the iris diaphragm	1												
4	Place the slide on the stage of the microscope	0.5												
5	Bring the low power objective into position	0.5												
6	Make coarse adjustments to focus the image	2												
7	Use the fine adjustment screw for final focusing	2												
8	Adjust the mechanical stage and focus the WBC counting squares	2												
9	Turns off the microscope light	0.5												
	Total	**10**												
	Converted to	**4**												

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Hematology – OSPE

Prepare an ideal peripheral smear. **(4Marks)**

Sl. No	Student does the following	Max. marks	Reg.No											
1	Clean the slide	0.5												
2	Select the spreader	0.5												
3	Under Aseptic precaution prick either of the middle 3 fingers	1												
4	Place the drop of blood at the 1 end of the slide	1												
5	Hold the opposite side of the slide with middle, index and thumb of the left hand	1												
6	Place the spreader at the 30-45^{0}angle	1												
7	Push the spreader with study, smooth, quick movement	2												
8	Dry by immediately waving the slide in the air	1												
9	Quality of ideal smear	2												
	Total	**10**												
	Converted to	**4**												

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Hematology-OSPE

Determine your Bleeding time using filter paper method. **(4Marks)**

Sl. No	Student does the following	Max. marks	Reg.No											
1	Sterilize the (Index/middle/ring) finger) using alcohol	1												
2	Air dry the finger without contaminating the fingertip	1												
3	Perform a skin prick with the lancet	1												
4	Blot the blood at regular intervals (every 30 seconds) using the filter paper without disturbing the clot formation until no blood is transferred to the paper.	4												
5	Observe and report the bleeding time.	2												
6	Proper disposal of lancet	1												
	Total	**10**												
	Converted to	**4**												

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Hematology-OSPE

Determine your Blood group. **(4Marks)**

Sl. No	Student does the following	Max. marks	Reg.No											
1	Sterilize the (Index/middle/ring) finger) using alcohol	1												
2	Air dry the finger without contaminating the fingertip	1												
3	Perform a skin prick with the lancet	1												
4	Add a drop of blood to the test tube containing normal saline.	1												
5	Place a drop of antisera A, B, and D on 3 different slides. Add a drop of diluted blood to the antisera.	1												
6	Uses 3 different sticks for mixing the blood with antisera	1												
7	Observe and report blood group.	3												
8	Proper disposal of lancet	1												
	Total	**10**												
	Converted to	**4**												

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SKILL CHECKLIST- PY 5.12 RECORD BLOOD PRESSURE & PULSE AT REST IN A VOLUNTEER

1.	Make the subject comfortable and explain the procedure, take the consent, hand wash with sanitizer
2.	Expose the arm
3.	Squeezes all air out of cuff before applying to subject
4.	Tie the cuff of sphygmomanometer around the arm of the subject properly (neither tight or lose) about 2.5 cm above the cubital fossa, in such a way that midpoint of the rubber bag of the cuff overlies brachial artery.
5.	Check the mercury column of the sphygmomanometer is adjusted to zero reading
6.	Keep the sphygmomanometer is at the level of heart of subject
7.	Palpate the radial artery
8.	The palpatory systolic pressure is measured by palpating for the radial artery, closing the valve, and pumping up the cuff. (Deflates cuff slowly and notes the point of reappearance of pulse)
9.	Release the air from the cuff and waits 30 seconds
10.	The student reports the Palpatory Systolic Pressure
11.	Raise the mercury column about 30 mm Hg above the palpatory level
12.	Uses stethoscope properly, checks it for amplification of sounds
13.	Place the diaphragm of stethoscope medial to tendon of biceps where the pulsation of brachial artery is felt
14.	Slowly reduce the mercury column by releasing the pressure in the cuff at rate 2-4 mm Hg while decreasing the mercuric column auscult for appearance, change in quality and disappearance of sounds
15.	Release the pressure from cuff
16.	Report, Arm used, position of the subject, hand wash with sanitizer

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SKILL CHECKLIST- PY 5.12 RECORD PULSE AT REST IN A VOLUNTEER

1.	Stands on the right side of the subject	
2.	Make the subject comfortable and explain the procedure, take the consent, hand wash with sanitizer	
3.	Position the hand	Flexion at elbow
4.		Semi-pronation at wrist
5.		Semi-flexion at wrist
6.	Palpates the radial pulse at the lower end of the radius	
7.	Uses three fingers for palpation	
8.	Counts for full one minute	
9.	Checks for radio radial delay	
10.	Checks for condition of the vessel wall	
11.	Examine all the peripheral pulses	
12.	Reports	
13.	Thanks the subject hand wash with sanitizer	

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SKILL CHECKLIST-CVS Examination PY 5.15

Satisfactory (√), unsatisfactory (X)

Steps

- Introduce to the subject
- Asks the subject to sit
- Make the subject comfortable
- Informs subject about the procedure and takes informed consent.

Inspection

a) Skeletal deformity
b) Dilated and engorged superficial veins:
c) Apical pulsation
d) Other pulsations
Uses hand sanitizer
e) Jugular Venous Pressure (JVP)

- Subject is made to lie on his back with upper part of body supported at an angle of 45 degrees to the horizontal with chin slightly pointing to the left
- Neck is inspected for venous pulsation and if seen, the upper border is noted
- Zero of one scale is placed over the sterna angle
- Using another scale, the upper border of the venous pulsation is approximated to the scale placed at the sternal angle and the reading is noted.
- The reading is expressed in cm of water.

Palpation

Uses hand sanitizer

- ***Position of the trachea***
  - Ensure subject's neck musculature is relaxed – chin slightly upwards
  - Method 1: Keep index finger and ring finger on either side of supra sternal notch. Palpates the tracheal rings from above downwards with middle finger
  - Method 2: Dip index finger between trachea and sternocleidomastoid muscle. Gently applies side pressure to locate the trachea & compare this space to the other side of the trachea using the same process.
  - Confirm the tracheal position
- ***Position of the apex beat***

Explain the procedure.
Expose the precordium
Inspect for the apex beat
Put the palm on the precordium over the mitral area to feel apical pulsation
Use the ulnar border of the hand to further confirm the pulsation
Use the tip of the finger to finally locate the apex, and mark the position
Count the intercostals space from 2^{nd} onwards

- **Parasternal heave**

Explain the procedure and take consent
Subject is asked to lie supine
Stand on the right hand side of the subject
Expose the precordium
Place the ulnar border of the palm on the lower end of the left parasternal line

Ask the subject to take deep breath and withhold in inspiration
Observe the hand over sternal edge for any upward lift

- **Thrills**

Palpate all over the precordium for thrills

- **Tender points**
  - Palpate all over the precordium for tender points
- **Direction of flow in veins**

Percussion

- **Left heart border**
  - The position of apex beat is first ensured.
  - Start percussing from left 5th intercostal space from midaxillary line and come medially to locate the heart dullness
  - Percuss in left 4th intercostal space from midaxillary line and come medially to locate the heart dullness.
  - Percuss in left 3rd intercostal space from midaxillary line and come medially to locate the heart dullness
  - Percuss in left 2nd intercostal space from lateral to medial and locate the heart dullness
  - A line joining all the points of dullness from 2nd to 5th intercostal spaces is the left heart border
- **Right heart border**
  - Upper border of liver dullness is first demarcated by starting the percussion downwards along the midclavicular line till the resonance changes to dullness
  - Two spaces above liver dullness, percussion is carried out towards the right sternal margin.

Auscultation

- Place the diaphragm of the stethoscope over the respective areas
- Examine following areas:
  - Mitral area (half inch medial to midclavicular line in the left 5th intercostal space) : reports as both S1 and S2 heard, S1 better heard than S2
  - Tricuspid area (area lying just to the left of the lower end of the sternum) : reports as both S1 and S2 heard, S1 better heard than S2
  - Aortic area (Lies to the right of the sternum in the 2nd intercostal space) : reports as both S1 and S2 heard, S2 better heard than S1
  - Pulmonary area (Lies to the left of the sternum in the 2nd intercostal space) : reports as both S1 and S2 heard, S2 better heard than S1
- ***Any added sounds***

Report the findings of inspection, palpation, percussion and auscultation
Uses hand sanitizer after the examination and Thanks the subject

Grade
Name and Signature of the assessor
I have received detailed feedback on my performance including my grade, the errors that I have committed and actions to be taken. (student's signature)

Certifiers name and signature with date of certification:
Signature, name and Roll No. of student

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Deemed to be University

SKILL CHECKLIST-RS Examination PY 6.9

Satisfactory (√), unsatisfactory (X)

Steps

- Introduce to the subject
- Asks the subject to sit
- Make the subject comfortable
- Informs subject about the procedure and takes informed consent.

Inspection

a) Shape and symmetry of the chest
b) Movements of the chest:
c) Respiratory movements:

- Respiratory rate:
- Rhythm
- Depth
- Type of respiration

Palpation

Uses hand sanitizer

- ***Position of the trachea***
  - Ensure subject's neck musculature is relaxed – chin slightly upwards
  - Keep index finger and ring finger on either side of supra sternal notch (OR Dip index finger into the thorax beside the trachea)
  - Palpates the tracheal rings from above downwards with middle finger (OR Then gently applis side pressure to locate the trachea &Compare this space to the other side of the trachea using the same process)
  - Confirm the tracheal position
- ***Position of the apex beat***
  - Explain the procedure.
  - Expose the precordium
  - Inspect for the apex beat
  - Put the palm on the precordium over the mitral area to feel apical pulsation
  - Use the ulnar border of the hand to further confirm the pulsation
  - Use the tip of the finger to finally locate the apex, and mark the position
  - Count the intercostals space from 2^{nd} onwards
- Expansion of the chest
- Tenderness
- ***Tactile Vocal Fremitus***
  - Place the ulnar border of the right hand over the respective intercostals areas
  - Ask the subject to repeat "99" (Or similar) and feel the vibrations
  - Examined similarly on both sides
  - Examine following areas anteriorly: Supraclavicular, infraclavicular, mammary and inframammary area
  - Examine following areas posteriorly: suprascapular, interscapular and infrascapular Both hands crossed position.
  - Examine following areas in axilla: Axillary and infraaxillary with hands over the head

Percussion

- Place the pleximeter (middle finger of the left hand) firmly on the intercostals space horizontal to the ribs.

- Other fingers should not touch the chest wall , on the side of the chest
- Strike the pleximeter finger with the percussing finger (middle finger of the right hand) by moving the wrist joint.
- After each stroke immediately lifts the percussing finger
- Percuss Anteriorly, Posteriorly and axillary areas and note the resonant sounds.
- Percuss the opposite side of the chest and compare.

Auscultation

- ***Breath Sounds: Intensity/Character***:
  - Place the diaphragm of the stethoscope over the respective areas
  - Ask the subject to deep breathe through mouth
  - Examined similarly on both sides
  - Examine following areas anteriorly: Supraclavicular, infraclavicular, mammary and inframammary area
  - Examine following areas posteriorly: suprascapular, interscapular and infrascapular Both hands crossed position.
  - Examine following areas in axilla: Axillary and infraaxillary with hands over the head
- ***Vocal Resonance***
  - Place the diaphragm of the stethoscope over the respective intercostals areas
  - Ask the subject to repeat ”99” (Or similar) and feel the vibrations
  - Examined similarly on both sides
  - Examine following areas anteriorly: Supraclavicular, infraclavicular, mammary and inframammary area
  - Examine following areas posteriorly: suprascapular, interscapular and infrascapular Both hands crossed position.
  - Examine following areas in axilla: Axillary and infraaxillary with hands over the head
  - ***Adventitious sounds***

Report the findings of inspection, palpation, percussion and auscultation
Uses hand sanitizer after the examination and Thank the subject

Grade

Name and Signature of the assessor

I have received detailed feedback on my performance including my grade, the errors that I have committed and actions to be taken.
(student’s signature)

Certifiers name and signature with date of certification:
Signature, name and Roll No. of student

YENEPOYA
Deemed to be University

SKILL CHECKLIST-Higher Mental function

Satisfactory (√), unsatisfactory (X)

Steps

- Introduce to the subject
- Make the subject comfortable
- Informs subject about the procedure and takes informed consent.
- Stands on the right side of the subject
- Provide proper instructions to the subject

I. Conciousness:

- Check if patient is conscious or unconscious and determine the level of consciousness.

  Level of consciousness
  - Awake
  - Lethargy
  - Obtundation
  - Stuporous
  - Coma

II. General appearance:

- Look for the general appearance of the patient, eg: Height, weight, mannerism/ well dressed/ poorly dressed

III. Behaviour:

- Looks for patients behaviour, Eg: co-operates with examination, good/poor eye contact, well behaved.

IV. Orientation to time, place and person:

- Asks questions to determine if the patient is well oriented to time, place and person

V. Motor disturbances:

- Looks for any motor disturbances like tremors, restlessness, slow/ fast movements.

VI. Sensory disturbances

- Looks for any sensory disturbances like does/doesn't respond to them or any stimuli, Visual/ Auditory Hallucinations

VII. Emotional state:

- Asks and looks for patients emotional behaviour (Happy/ sad/ deppressed/ angry/ euphoric etc)

VIII. Thought process and content:

- Assess the thought process is linear, logical and well oriented by questioning (How do you prepare tea/ coffee/ omelette)
- Assesses the patient thought content (Delusional/ suicidal/ phobias etc)

IX. Attitude and insight:

- Assess the attitude and insight of patient. Eg Patient response to their illness (Optimistic/ Pessimistic)

X. Intelligence:

- Checks the intelligence (calculation/ naming months etc)

XI. Memory:

- Assess immediate memory
- Assesses remote memory
- Assesses long term memory

XII. Judgement and reasoning

- Assesses judgement of patient to a given particular situation (Eg: House on fire)
- Assesses reasoning of patient (Odd one out: reasons which is odd and why)

XIII. Language and Speech:

- Comprehension
- Fluency
- Grammer
- Naming
- Reading
- Writing
- Repetition

Grade
Name and Signature of the assessor
I have received detailed feedback on my performance including my grade, the errors that I have committed and actions to be taken. (student's signature)

Certifiers name and signature with date of certification:
Signature, name and Roll No. of student

YENEPOYA
Deemed to be University

SKILL CHECKLIST-Sensory System Examination PY 10.11

Satisfactory (√), unsatisfactory (X)

Steps
• Introduce to the subject • Make the subject comfortable • Informs subject about the procedure and takes informed consent. • Stands on the right side of the subject • Provide proper instructions to the subject • Uses hand sanitizer • Ask subject to close his/her eyes. • Elicit the sensation dermatome-wise on both sides of the body. • Ask the subject to indicate whether he feels the specific sensations **I. Anterior spinothalamic tract** **Crude touch** • Provide proper instructions to the subject. • Elicit the crude touch by touching with your finger tip/ blunt object on the skin of different dermatomes. • Ask the subject to indicate whether he feels crude touch **II. Lateral spinothalamic tract** **Superficial pain** • Provide proper instructions to the subject that you will be eliciting pain. • With the help of a pin (not a needle), lightly prick the skin of different parts of the body and ask the subject to indicate whether he feels pain. • Elicit pain from all dermatomes of both sides of the body. **Deep pain** Steps • Provide proper instructions to the subject. • Deep pain is elicited by squeezing the muscle or tendon (Achilles tendon and Biceps Brachii) till pain is produced. Repeat the procedure on the identical points of the body on the opposite side and compare the results. **Temperature** Steps • Gives proper instructions to the subject (to say whether he feels cold or warm when touched with different glass tubes). • Take two test tubes containing warm and cold water separately. • Place the test tubes on the skin of the subject, each in turn or randomly and ask the subject to say whether he feels warm or cold. Examine warm and cold sensation on all the dermatomes of both sides of the body and note your observation. **III. Dorsal column pathway** **Fine touch** Steps • Provide proper instructions to the subject (to raise his/her finger or say 'yes' when he feels the sensation of touch). • Ask the subject to close his/her eyes.

- With the help of cotton wool, lightly touch the skin of the different parts of the subject.
- If the subject raises his/her finger or says 'yes' enquire whether the feeling is normal or different. If the subject does not feel the sensation, compare carefully with the corresponding area on the opposite part of the body.

Pressure

Steps

- Provide proper instructions to the subject.
- Ask the subject to close his/her eyes.
- Elicit the pressure sensation by pressing with your finger tip on the skin of different dermatomes.

Tactile localization

Steps

- Provide instructions to the subject to localize (with the help of a ballpoint pen) the part of the body that is touched by the tip of a pen.
- Ask the subject to hold a pen and close his/her eyes.
- Touch the skin of one area of the body with the help of a ball pen and ask the subject to immediately localize that point touching with the pen that he is holding.
- Measure the distance between the two points - the localization distance.
- Likewise, determine the localization distance on different parts of the body on both sides.

Two – point discrimination

- Provide instructions to the subject to say whether he feels the touch of one point or two points when he is touched by a compass aesthesiometer.
- Ask the subject to close his/her eyes.
- Separate the two limbs of the compass aesthesiometer a little and touch the skin of the subject lightly with the two points of the aesthesiometer simultaneously. Ask the subject to say whether he is being touched at one or two points.
- If the subject says one point, increase the distance between two points a little more and repeat the test till two separate points are appreciated by the subject (the distance between two points is called the minimum separable distance).
- Record the minimum separable distance on different parts of the body on both the sides.

Stereognosis

Steps

- Provide instructions to the subject to identify the object when asked to handle it.
- Ask the subject to close his/her eyes.
- Place a familiar object in one hand of the subject and ask him to recognize it by palpating the object.
- Repeat the procedure with four to five familiar objects.
- Repeat the procedure in the opposite hand.

Graphasthesia

- Provide instructions to the subject to identify the alphabet/number when traced on the skin.
- Ask the subject to close his/her eyes.
- Trace any alphabet/ number on the skin of the subject and ask him to identify it.
- Repeat the procedure in the opposite side.

Sense of Position and Joint Movement

- Provide proper instructions to the subject (to recognize the particular position of the limb when the limb is moved).
- Ask him to close his/her eyes.
- Move his/her finger or hand, up and down and ask the subject to recognize the movement by calling out the position of the finger/limb or by imitating the same movement in the other limb.
- Repeat the procedure by changing the position of all the limbs.

Sense of Vibration

- Provide proper instructions to the subject.
- Make the tuning fork (128 Hz) vibrate by hitting the blades of the fork against the hypothenar eminence of the palm.
- Place the foot of the vibrating tuning fork on bony prominences like the styloid process of the radius and medial or lateral malleolus and ask the subject whether he feels the vibration.
- Ask the subject to raise his/her finger when he ceases to feel the vibration.
- Immediately place the tuning fork on the corresponding bony prominence of your body and note whether you can still perceive the vibration.

Romberg's test

- Provide proper instructions to the subject asking him to stand with his/her feet close together and ask him to stand with
  i. Eyes open.
  ii. Eyes closed.
- Position yourself behind the subject with open arms
- Look if subject sways
  If subject sways report as positive, if not report as negative.

Grade
Name and Signature of the assessor
I have received detailed feedback on my performance including my grade, the errors that I have committed and actions to be taken. (student's signature)

Certifiers name and signature with date of certification:

Signature, name and Roll No. of student

SKILL CHECKLIST-Motor System Examination PY 10.11

Satisfactory (√), unsatisfactory (X)

Steps
• Introduce yourself to the subject. • Make the subject comfortable. • Informs subject about the procedure and takes informed consent. • Stands on the right side of the subject. • Provide proper instructions to the subject. • Uses hand sanitizer. **I. Bulk of Muscles:** • Give proper instructions to the subject. • Ask the subject to sit on a stool or lie down on a couch comfortably and remove all his clothing. • Inspect the muscle mass of all parts of the body and note if there is any wasting (atrophy) or hypertrophy of any particular group of muscles. • Palpate the muscle to assess the consistency. • Compare the bulk of the muscles of both sides of the body. • Measure the midarm and midforearm circumference in the upper limbs, and midthigh and midcalf circumference in the lower limbs of both sides with of a measuring tape. • Report the findings. **II. Tone of Muscles:** • Give proper instructions to the subject. • Ask the subject to relax completely. • Passively move different parts of the body at various joints and try to feel the degree of resistance encountered during each passive movement. • Assess and compare the tone of muscles of both sides of the body simultaneously. • Report the findings. **III. Strength of Muscles:** • Give proper instructions to the subject. • Ask the subject to perform a movement of any part of the body and you oppose the movement actively. • Compare the strength of the same group of muscles of the other side simultaneously. • Test the strength of muscles of the lower limbs, upper limbs and the trunk of the body. • Report the findings. **Testing The Strength of Muscles of the Upper Limbs:** • Dorsal interossei • Palmar interossei • Lumbricals • Flexors of the fingers • Flexors of the wrist

- Extensors of the wrist
- Brachioradialis
- Biceps
- Triceps
- Supraspinatus
- Deltoid
- Infraspinatus
- Pectorals
- Serratus anterior
- Lattisimusdorsi

Testing The Strength of Muscles of the Trunk:

- Abdominal muscles
- Erector spinae and muscles of the back

Testing The Strength of Muscles of the Lower Limbs:

- Dorsiflexor and plantar flexors of the feet and toes
- Evertors and invertors of the foot
- Evertors of the knee
- Flexors of the knee
- Extensors of the thigh
- Flexors of the thigh
- Adductors of the thigh
- Abductors of the thigh
- Rotators of the thigh or hip

IV. Reflexes:

<u>Deep Reflexes</u>:

Biceps Jerk (C5,C6):

- Give proper instructions to the subject.
- Ask the subject to relax.
- Flex the elbow of the subject to a right angle and place his forearm in a semi-pronated position and support with your hand, with subject in sitting position or in supine position or by placing his elbow on his abdomen, with the subject in lying position on the bed.
- Place your thumb firmly on the biceps tendon.
- Strike your thumb with the help of the pointed end of the knee hammer so that the biceps tendon stretches by striking the thumb.
- Observe the contraction of the biceps muscle and the flexion at the elbow.
- Elicit the biceps jerk of the other limb and compare.
- Report the findings.

Triceps Jerk (C6,C7):

- Give proper instructions to the subject.

- Ask the subject to relax.
- Flex the subject's arm at elbow and allow the forearm to rest on his abdomen or be supported by your hand.
- Observe the contraction of the triceps muscle and extension at the elbow.
- Elicit the triceps jerk of the other limb and compare.
- Report the findings.

Supinator or Brachioradialis Jerk (C5,C6):

- Give proper instructions to the subject.
- Ask the subject to relax.
- Hold the hand of the subject in sitting position or allow the forearm of the subject to on his abdomen in supine position and slightly stretch the brachioradialis muscle by laterally bending the hand in opposite direction.
- With the help of a knee hammer strike the radius 1-2 inches above the wrist over its styloid process.
- Observe the flexion at the elbow and supination of the forearm.
- Elicit the supinator jerk of the other side and compare.
- Report the findings.

Knee Jerk (L2,L3,L4):

- Give proper instructions to the subject.
- Ask the subject to relax.

In the supine position- Expose the part (upto the upper thigh)

- Pass your forearm under the knee to be tested and place your hand on the opposite knee.
- Semiflex the knee and lift your hand slightly so that the weight of the knee rests on your hand.
- Strike the patellar tendon directly with the help of a knee hammer.
- Observe the contraction of the quadriceps and brief extension at the knee.
- Elicit the knee jerk of the opposite and compare.
- Report the findings.

In the sitting position-Ask the subject to sit over the edge of the bed or a stool in such a way that his legs dangle freely from the edge, or ask the subject to keep one knee on the other knee.

- Ask him to relax completely.
- Strike the patellar tendon.
- Observe the contraction of the quadriceps and the extension at the knee joint.
- Elicit the knee jerk of the opposite and compare.
- Report the findings.

Ankle Jerk (S1,S2):

- Give proper instructions to the subject.
- Ask the subject to relax.

In the supine position- Place the lower limb (to be examined) of the subject on the bed in such a way that it is everted and slightly flexed.

- With one hand, slightly dorsiflex the foot so as to stretch the Achilles tendon.

- With the other hand, strike the tendon on its posterior surface by using the broad end of a knee hammer.
- Observe for any contraction of calf muscles and plantar flexion of the foot.
- Elicit the ankle jerk of the opposite and compare.
- Report the findings.

In the sitting position-Ask the subject to kneel on a chair or on a bed with feet projecting out.

- Slightly dorsiflex the foot.
- Strike the Achilles tendon.
- Observe for contraction of calf muscles and plantar flexion of the foot.
- Elicit the ankle jerk of the opposite and compare.
- Report the findings.

Jaw Jerk:

- Give proper instructions to the subject.
- Ask the subject to relax.
- Ask the subject to partially open his mouth.
- Place a finger firmly on his chin.
- Strike the finger with the narrow end of a knee hammer.
- Observe for immediate closure of the mouth (due to the contraction of the elevators of the jaw).
- Report the findings.

Superficial Reflexes:

Conjunctival reflex:

- Give proper instructions to the subject.
- Bring a piece of cotton wool form the side of the subject and immediately touch the conjunctiva.
- Look for the response (subject blinks his eyes).
- Report the findings.

Corneal reflex:

- Give proper instructions to the subject.
- Touch the limbus, that is, the sclerocorneal junction of the eye with cotton wool and look for the response (blinking of the eyes).
- Report the findings.

Plantar Reflex (L5,S1):

- Give proper instructions to the subject.
- Ask the subject to lie down on the couch.
- Partially flex the lower limb and rotate it externally.
- With one hand, grasp the leg just above the ankle joint.
- Ask the subject to relax completely.
- In the other hand, with the help of a pointed object gently scratch the outer edge of the sole of the foot from the heel towards the little toe and then medially across the metatarsus

towards the ball of the great toe.
- Observe for the plantar response.
- Report the findings.

Abdominal Reflex (T7-T12):
- Give proper instructions to the subject.
- Ask the subject to lie down in the supine position.
- Expose the abdomen fully.
- Ask the subject to relax completely.
- Stroke lightly but briskly each side of the abdomen above and below the umbilicus, with a key or a pencil or the pointed metallic end of the knee hammer from the outer aspect towards the midline.
- Observe the contraction of the abdominal muscles after every stroke as evidenced by the deviation of the umbilicus towards the stimulus.
- Report the findings.

V. Coordination of Movement:

<u>Upper Limb</u>:

Finger-Nose Test:
- Provide proper instructions to the subject.
- Ask the subject to touch the tip of his nose with the tip of his index finger rapidly and repeatedly, first with the eyes open, and then with the eyes closed.
- Observe whether the subject is able to touch his nose every time.
- Ask the subject to repeat the test with the other hand.
- Report the findings.

Making a circle:
- Provide proper instructions to the subject.
- Ask the subject to draw a circle in the air with his forefinger.
- Observe whether the subject is able to draw a circle.
- Ask him to repeat with the other hand.
- Report the findings.

Dysdiadokokinesis:
- Ask the subject to flex his elbow to a right angle and then ask him to perform supination and pronation of his forearm as rapidly as possible.
- Ask the subject to clap over the dorsum of one hand with the palm of another hand as quickly as possible. He may be asked to perform this movement alternately on either hand.
- Report the findings.

<u>Lower Limb</u>:

Knee-Heel Test:
- Ask the subject to lie down in the supine position.

- With the eyes open, ask him to place one heel on the opposite knee and then to slide the heel down the shin of his leg towards the ankle.
- Ask him to repeat the procedure in quick succession.
- Observe whether he performs the action properly.
- Ask him to repeat the procedure with the other limb.
- Report the findings.

Making a circle:

- Provide proper instructions to the subject.
- Ask the subject to draw a circle in the air with his toes.
- Observe whether the subject is able to draw a circle.
- Report the findings.

Tandem walking/ walking in a straight line:

- Ask the subject to walk on a straight line.
- Observe whether he is able to walk on a straight line.
- Report the findings.

VI. Gait:

- Provide proper instructions to the subject.
- Ask the subject to walk with bare feet on a straight line.
- Ask him to walk a distance and then to turn round and come back.
- While the subject is walking observe the following points:
  - Whether he walks at all.
  - If he walks, does he walk in a straight line or does he tend to deviate to one side.
  - If he tends to fall, in what direction?

VII. Involuntary Movement:

- Observe whether there is any involuntary movement (tremors, fasciculation, fibrillation, athetosis, chorea, etc) of any part of the body.
- If involuntary movements are present, note the type of movement.

Grade
Name and Signature of the assessor
I have received detailed feedback on my performance including my grade, the errors that I have committed and actions to be taken. (student's signature)

Certifiers name and signature with date of certification:
Signature, name and Roll No. of student

YENEPOYA
Deemed to be University

SKILL CHECKLIST-Cranial Nerve Examination PY 10.11

Satisfactory (√), unsatisfactory (X)

Steps

- Introduce yourself to the subject
- Make the subject comfortable
- Informs subject about the procedure and takes informed consent.
- Stands on the right side of the subject.
- Provide proper instructions to the subject.
- Uses hand sanitizer.

I. Olfactory Nerve:

- Provide proper instructions to the subject.
- Ask the subject to sit comfortably on a stool.
- Make sure that both the nostrils are patent and there is no inflammation of the nasal mucosa.
- Ask the subject to close his eyes and one of his nostrils.
- Remove the cap of the bottle containing clove oil and take the bottle close to the open nostril.
- Ask the subject if he correctly perceives the smell.
- Repeat the procedure with peppermint oil.
- Ask the subject to close this nostril and open the other nostril, and repeat the procedure.
- Compare the results of both the nostrils.
- Note your result. Express the result as smell normal, reduced, absent or perverted, separately for each nostril.
- Report the findings.

II. Optic Nerve:

Confrontation Test:

- Provide proper instructions to the subject.
- Ask the subject to sit on a stool comfortably in an erect position.
- Sit on a stool in front of the subject in such a way that your eyes and the subject's eyes remain at the same level and at a distance of about 3 feet.
- Ask the subject to fix his gaze at the tip of your nose.
- Ask the subject to close one of his eyes and close your opposite eye.
- Move your finger midway between you and the subject to test the field of vision of four quadrants (upper, lower, nasal and temporal). Bring your finger from the periphery of the four quadrants to the centre of the visual and ask the subject to say 'Yes' when he sees the finger.
- Compare the patient's field of vision with yours and note your observation.
- Repeat the procedure with the other eye.
- Report the findings.

Visual Acuity:

Test for Distant Vision (Snellen's chart):

- Provide proper instructions to the subject.

- Ask the subject to sit at a distance of 6 metres from the chart.
- Ask him to close one of his eyes and read the chart with the other eye.
- Note up to which line the subject is able to read comfortably.
- Ask him to repeat the procedure with the opposite eye.
- Report the findings.

Test for Near Vision (Jaeger's chart):

- Provide proper instructions to the subject.
- The room should be well-lit and the subject should sit comfortably.
- Hold Jaeger's chart at a distance of 10-12 inches from the subject's eyes.
- Ask the subject to read the letters of the different sizes.
- Note the smallest type of the letters that the subject can read comfortably.
- Repeat the test separately for each eye with the other eye closed.
- Report the findings.

ColourVision (Ishihara's chart):

- Gives proper instructions to the subject.
- Ask the subject to sit comfortably in a well-lit room.
- Instruct the subject to read the numbers or trace the lines in each plate of the book.
- Report the findings.

III. Oculomotor, Trochlear &Abducent Nerves:

- Provide proper instructions to the subject.
- Ask the subject to sit comfortably on a stool and you sit in front of the subject.
- Examine the eyes of the subject for the presence of ptosis and nystagmus if any.
- Give instructions to the subject to follow the direction of movement of your finger.
- Bring your index finger to the front of the subject's eyes, keeping a distance of around 25 cm from the subject.
- Ask the subject to look at and follow the movements of your index finger, and observe the movement of the eyeball of the subject while moving your finger.
- First, move your finger laterally to the right. From there move your finger vertically upwards and downwards.
- Then move your finger laterally to the left. From there, move your finger vertically upward and downward.
- Examine the pupillary reaction to light. Put a piece of cardboard between the two eyes or place your hand between the eyes. Switch on the torch and bring the torch from the side of the subject and immediately focus the light onto one of his eyes and look for the reaction of the pupil of that eye (direct light reflex) as well as the pupil of the other eye (indirect or consensual light reflex).
- Examine the pupillary reaction to accommodation (accommodation reflex). Ask the subject to look at a point midway between the two eyes and very close to the eyes of the subject. Ask the subject to look at the tip of your index finger. Examine for medial deviation and pupillary constriction of both the eyes.
- Report the findings.

IV. Trigeminal Nerve:

- Provide proper instructions to the subject.

- Ask the subject to sit comfortably on a stool.
- Examine all the sensations of the face keeping the area supplied by the ophthalmic, maxillary and mandibular division in mind.
- Examine the motor function. Ask the subject to clench his teeth and palpate the prominence of the temporal and masseter on both sides by palpating the temple and the upper part of the cheek. Ask the subject to open his mouth and look for deviation of the jaw, if present. Ask the subject to do side to side movement of the jaw.
- Test the conjunctival reflex. Bring a piece of cotton wool form the side of the subject and immediately touch the conjunctiva. Look for the response (subject blinks his eyes).
- Test the corneal reflex. Touch the limbus, that is, the sclerocorneal junction of the eye with cotton wool and look for the response (blinking of the eyes).
- Elicit jaw jerk. Ask the subject to partially open his mouth. Place your left index finger in the groove under the lower lip and lightly tap on the nail of the finger with the help of the knee hammer. Observe the response (if the jerk is present, the mouth snaps shut).
- Report the findings.

V. Facial Nerve:

- Provide proper instructions to the subject.
- Ask the subject to frown or open his eyes wide. Look for the wrinkling of the forehead.
- Ask the subject to shut his eyes as tightly as he can. Try to open the eyes while he tries to keep them closed.
- Ask the subject to show his teeth. Look for deviation of the angle of the mouth if present.
- Ask the subject to inflate his mouth with air and blow out his cheeks.
- Ask the subject to whistle.
- Ask the subject to clench his teeth and observe the prominence of the platysma muscle in the neck.
- Test the taste sensations from the anterior2/3rdof the tongue. Ask him to protrude the tongue. Dip one glass rod in the sweet solution and touch different parts of the tongue of the subject with the tip of the rod. Ask him what taste he senses. Similarly repeat the procedure with the salty, sour and bitter solutions by using separate glass rods for each solution.
- Report the findings.

VI. Vestibulocochlear Nerve:

- Provide proper instructions to the subject.
- Ask the subject whether he has giddiness, dizziness and vertigo.
- Examine the subject's eye for the presence of nystagmus.
- Report the findings.

Tuning Fork Tests:
Rinne's test:

- Give proper instructions to the subject.
- Hold the stem of the tuning fork (512 Hz or 256 Hz) between the thumb and the index finger in such a way that the fingers do not touch the blades of the tuning fork.
- Make the tuning fork vibrate by suddenly stroking the blades of the fork against the hypothenar eminence or the thigh.
- Immediately place the base of the vibrating tuning fork on the mastoid process of one side and ask the subject to raise his finger when he ceases to hear the sound.
- Once he stops hearing, hold the vibrating tuning fork very close to his ear and ask him

whether he hears sound. When he stops hearing it, bring the tuning fork close to your ear to confirm whether the vibrating sounds have actually stopped.
- Record your observation.
- Report the findings.

Weber's test:
- Give proper instructions to the subject.
- Make the tuning fork (512 Hz or 256 Hz) vibrate by suddenly stroking the blades of the fork against the hypothenar eminence or the thigh.
- Place the base of the vibrating fork on the vertex of the skull or on the forehead of the subject.
- Ask the subject to indicate whether he hears equally on both sides or if the sound is better heard in one ear.
- Report the findings.

Schwabach test:
- Give proper instructions to the subject.
- Make the tuning fork (512 Hz or 256 Hz) vibrate by suddenly stroking the blades of the fork against the hypothenar eminence or the thigh.
- Place the vibrating tuning fork over the subject's mastoid process.
- Ask the subject to raise his finger when he stops hearing the sound.
- Immediately bring the tuning fork close to your own ear and check if you still hear the sound.
- Report the findings.

VII. Glossopharyngeal Nerve:
- Provide proper instructions to the subject.
- Ask the subject to sit comfortably on a stool and elicit all the taste sensations in the posterior 1/3rd of the tongue.
- Ask the subject to open his mouth wide. Tickle the back of the pharynx with the help of a swab stick, and observe the contraction of the posterior pharyngeal wall.
- Ask the subject to lie down and record his blood pressure. Then ask him to stand up and immediately record his blood pressure.
- Report the findings.

VIII. Vagus Nerve:
- Provide proper instructions to the subject.
- Ask the subject to open his mouth wide and say 'aaah'. Observe the arch of the palate and whether the arch is formed equally on both the sides or is flat on one side or both sides.
- Elicit the pharyngeal reflex as described for the ninth nerve.
- Report the findings.

IX. Accessory Nerve:
- Provide proper instructions to the subject.
- Stand behind the subject and press his shoulder. Ask the subject to shrug his shoulders against the passive resistance.
- Ask the subject to move his chin to one side. Try to prevent it by opposing the movement. Note the prominence of the sternomastoid muscle of the opposite side. Repeat the procedure by asking the subject to move his chin against resistance to the opposite side. Ask the subject to

depress his chin against the resistance of your hand.
- Report the findings.

X. Hypoglossal Nerve:
- Provide proper instructions to the subject.
- Ask the subject to protrude his tongue and note if the median raphe of tongue is concave towards one side. Also observe atrophy, fasciculation or tremor if present.
- Ask the subject to move his tongue from side to side and push his cheek laterally from inside. Resist the tongue movements by pressing it from the outside of the cheek.
- Report the findings.

Grade
Name and Signature of the assessor
I have received detailed feedback on my performance including my grade, the errors that I have committed and actions to be taken. (student's signature)

Certifiers name and signature with date of certification:
Signature, name and Roll No. of student