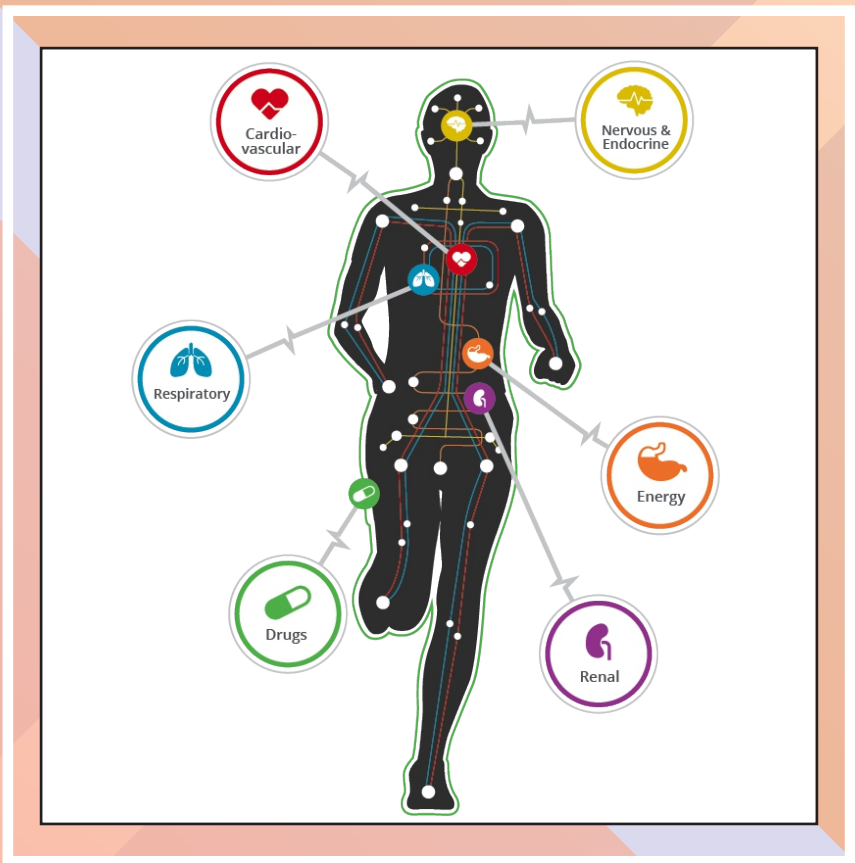
Operational Manual of MBBS Curriculum 2021

Subject: Physiology



Developed By-
Directorate General of Medical Education (DGME)
Mohakhali, Dhaka-1213

September-2022

Operational Manual of MBBS Curriculum 2021

Subject : Physiology

Developed By-

Directorate General of Medical Education (DGME)
Mohakhali, Dhaka-1212
September-2022

Preface

Curriculum is not the sole determinant of the outcome, it is very important as it guides the faculty in preparing their instruction and tells the students what knowledge, skills and attitude they are to develop through the teaching learning process. The ultimate indicators of assessing curriculum in medical education is the quality of health services provided by its graduates with required competencies.

To implement that curriculum all concerned such as teachers, students, deans, administrators, policymakers to be more dynamic, should run smoothly with the time & appropriate pace. This operational manual to implement the curriculum will act as a catalyst, will give momentum in implementing the curriculum. This operational manual will help to implement the curriculum uniformly, effectively, efficiently & smoothly at all the govt. & non govt. medical colleges under all the universities all over the country.

I would like to mention that the curriculum planning process is continuous, dynamic and never-ending as it is not static. If it is to serve best, the needs of the individual student, teacher, educational institution and the community to whom we are ultimately accountable, must be assessed. Before that assessment we should seriously concentrate for the better implementation of the curriculum. Implementation in regards to teaching-learning, integrated teaching, teaching on generic topics on medical humanities, clinical teaching, ambulatory care/OPD based teaching and acquiring identified competencies of each subject. There is a proverb that "Assessment drives Learning". To ensure students' learning formative and summative assessments should be taken care of properly. This operational manual on developed MBBS curriculum 2021 will play a vital role in those regards.

I congratulate all who were involved in developing this operational manual to implement MBBS curriculum 2021, particularly the Director (Research, Publication & Curriculum Development), DGME, focal persons & heads of the departments of Anatomy, Physiology & Biochemistry of different Govt. and non Govt. medical colleges. Special appreciation to the Deans, Faculty Medicine of different Universities. They contributed a lot to complete this activity, a commendable job and deserve special appreciation.

Professor Dr. AKM Amirul Morshed
Director General
Directorate General of Medical Education (DGME)
Govt. of the Peoples Republic of Bangladesh
Mohakhali, Dhaka

Acknowledgement

It is easier to change a graveyard than to change a curriculum. Yet then time & society demand for the change of the curriculum. In such a situation MBBS curriculum 2012 was reviewed and updated in 2021 to fulfill the need of the stakeholders. For implementation of that reviewed & updated curriculum operational manual is also the demand of the present time.

For better implementation of integrated teaching, teaching as per identified competencies, teaching on generic topics on medical humanities, planning, designing, constructing assessment tools for formative and summative assessment, this operational manual will act as the road map.

Research, Publication & Curriculum Development (RPCD) of DGME in association with heads of the departments of Anatomy, Physiology & Biochemistry of Phase I of different Govt. & non govt. medical colleges & Deans Offices, DGME took the initiative to develop the operational manual. Online meetings were held through active participation of different professional groups, focal persons, faculty members, heads of the department of Anatomy, Physiology & Biochemistry of Phase I of all most all the govt. & non govt medical colleges of Bangladesh.

I hope this operational manual will help to serve as guiding principle for the students and as well as for faculty members.

Last but not least, I would like to extend my deep gratefulness to the Director General, DGME, ADG(ME), DGME, all Directors of DGME, faculty members of Anatomy, Physiology & Biochemistry of different Govt & non Govt medical colleges and others who shared their expertise, insights, contributed and worked hard to generate this precious document. Efforts given by the focal persons providing their valuable time, opinions & efforts during the development process of this operational manual for Phase I of MBBS curriculum are duly acknowledged.

Professor Dr. Md. Humayun Kabir Talukder
Director
(Research, Publication & Curriculum Development)
DGME, Mohakhali, Dhaka 1212

Background and Rationale

Curriculum is a study track along which students travel throughout the course of study. In this journey teachers play an important role in regards to teaching learning and assessment. To produce need based, community oriented, competent graduate medical doctors, MBBS curriculum was reviewed and updated in 2021. For better implementation of MBBS curriculum 2021 effectively, uniformly & competently an operation manual of each subject was felt by each of the Faculty of Medicine of all universities. In this regard Director (Research, Publication & Curriculum Development (RPCD) of DGME has taken the time felt initiative under the gradience of DG, DGME. Thanks to DG, DGME, Director (RPCD), DGME, focal persons and heads of the department of concerned subject of different government & non government medical colleges to finalise this operational manual. This operational manual will work as the skeleton of the curriculum in a comprehensive manner. This user-friendly document will serve the purposes of the faculty to ensure better teaching-learning and assessment.

Dr. Shahryar Nabi
Dean, Faculty of Medicine
Dhaka University (DU)

Professor Dr. Shahena Akter
Dean, Faculty of Medicine
Chottogram Medical University (CMU)

Professor Dr. Nowshad Ali,
Dean, Faculty of Medicine
Rajshahi Medical University (RMU)

Professor Md. Moynul Haque
Dean, Faculty of Medicine
Sylhet Medical University (SMU)

List of the Contributors

Name, Designation and Institute (not according to warrant of precedence)
Prof Dr A K M Amirul Morshed, Director General, DGME, Dhaka
Prof Dr Abu Yusuf Fokir, Additional Director General (Education), DGME, Dhaka
Prof Dr A K M Ahsan Habib, Director, Medical Education, DGME, Dhaka
Dr. Mostafa Khaled Ahmad, Director (Admin), DGME, Dhaka
Prof Dr. Md Amir Hossain, Director (HRM), DGME, Dhaka
Prof Dr. Kazi Afzalur Rahman, Director (Planning & Development), DGME, Dhaka
Prof Dr. Mosharraf Hossain Khondoker, LD, ME & HD, DGME
Prof Dr. Md. Humayun Kabir Talukder, Director (Research, Publication & Curriculum Development), DGME, Mohakhali, Dhaka & Coordinator, Operational manual development committee
Dr. Md. Masudur Rahman, Director (AM) Alternative Medicine, DGME
Dr. Misbah Uddin Ahmed. Director (Discipline), DGME.
Dr. Md. Jahangir Rashid, Director (Financial Management), DGME
Dr. A.F.M Shahidur Rahman, Director (Dental Education), DGME
Prof Dr Syeda Shahina Subhan, Director, Centre for Medical Education, Dhaka
Prof. Dr Shahryar Nabi, Dean, Faculty of Medicine, University of Dhaka
Prof. Dr. Nowshad Ali, Principal, Rajshahi Medical College and Dean, Faculty of Medicine, Rajshahi University
Prof. Dr. Md. Moynul Haque, Dean, Faculty of Medicine, SUST and Sylhet Medical University
Prof. Dr. Shahena Akter, Dean, Faculty of Medicine, University of Chottogram
Teachers of Physiology
Prof. Dr. Dilruba Begum, Dhaka Medical College, Dhaka
Prof. Dr. Md. Uzire Azam Khan, Abdul Malek Medical College, Noakhali
Prof. Dr. Chandra Rani Sarkar, Rangpur Medical College
Prof. Dr. Qazi Shamima Akhter, Physiologist, Ex Head, Physiology, Dhaka Medical College
Prof. Dr. Md. Obaidullah Ibne Ali, Principal, Pabna Medical college
Dr. Mansura Rahman, Associate Professor, Shaheed Suhrawardy Medical College, Dhaka.
Prof. Dr. Abida Ahmed, US Bangla Medical College
Prof. Dr. Ruhul Amin, Shahabuddin Medical College, Dhaka.
Prof. Dr. Shameema Begum, Popular Medical College, Dhaka
Prof. Dr. Mahmuda Begum, Sir Salimullah Medical College, Dhaka
Prof. Dr. Akhtarun Nessa, Mymensingh Medical College
Prof. Dr. Nasim Jahan , Enam Medical College
Prof. Dr. Rokeya Begum. Ex -Professor of Physiology
Prof. Dr. Rezina Mustarin, Jalalabad Ragib Rabeya Medical College
Dr Dipan Baidya Associate Professor (cc), Cumilla Medical College (CoMC)
Prof. Dr. Mihidur Rahman, Jessore Medical College
Prof. Dr. Momtaz Begum, Chattagram Medical College
Prof. Dr. Saidur Rahman, Shaheed Ziaur Rahman Medical College, Bogra
Dr. Ohida Sultana, Asstt. Professor, Sher E Bangla Medical College, Barisal
Dr. Md. Mizanur Rahman, Asstt. Prof. Khulna Medical College
Dr. Rezaul Hossain, Patuakhali Medical College
Prof. Dr. Shahin Mahmuda, Rajshahi Medical College
Prof. Dr. Jalal Uddin Chowdhury, Dhaka National Medical College, Dhaka
Prof. Dr. Nayma Sultana, Colonel Malek Medical College, Manikgang

Computer Compose
Kohinoor Akhter, CME

Cover Design:
Nizam Khan, Graphic Artist, CME

List of Contents

	Contents		Page No.
1.	Common Information and Activities of Phase I		7
2.	2:1.	**Physiology** Departmental Objectives	13
	2:2.	List of Competencies to acquire	13
	2:3.	Learning Objectives and Course Contents in Physiology	15
	2.4a.	Distributions of teaching /learning hours	27
	2:4b.	Distribution of Teaching Hours	27
	2.5.	Teaching/learning methods, teaching aids and evaluation	28
	2.6.	Time allocation in Physiology in different terms	28
	2.7.	Academic Calendar for Physiology	29
3.	Overview of Assessment in 1st Professional Examination		30
	3.1.	Assessment systems and marks distribution	30
	3. 2.	Written examination:	31
	3.2.1	Formative assessment:	32
	3.2.2	Multiple choice questions (MCQ) for each paper	33
	3.2.3	Short Answer Questions (SAQ):	34
	3.2.4	Structured Essay Questions (SEQ):	35
	3:3.	Structured Oral Examination (SOE)	36
	3:4.	Practical examination:	37
4.	Post Examination Procedure		39
5.	Students In-Course Evaluation Cards		40
	5:2.	Class Attendance Record	41
	5.3	Continuous Assessment Cards	42
6.	Provisional Tabulation Sheet		52

Overview of Assessment in 1st Professional Examination Implementing MBBS Curriculum 2021

Common Information and Activities of Phase I

1.1. Basic information

i. The course is offered in 3 terms (1st, 2nd& 3rd) and total duration of Phase I is 18 months including First professional MBBS examination. The course is expected to start on first day of January.

ii. First professional examination to be started on first working day of May and November.

iii. Time for integrated teaching, examination, and preparatory leave of formative and summative assessment is common for all subjects of the Phase I.

iv. Assessment:
   a) There will be in-course (item/card/ term) and end-course (professional) assessment for the students.
   b) Formative assessment will be done through results of term final examination and class attendance.

1.2. Distribution of teaching-learning hours/days in Phase I

Lecture	**Tutorial**	**Practical**	**Generic topic Teaching hours**	**Integrated teaching for Phase I**	**Formative Exam**		**Summative exam**		**Total Teaching hours**
					Preparatory leave	**Exam time**	**Preparatory leave**	**Exam time**	
120 hrs	120 hrs	97 hrs	7.5 hrs = 8 hrs	36hrs	35 days	42 days	30days	30 days	337
Time for integrated teaching, examination, preparatory leave of formative & summative assessment is common for all subjects of the phase									
Generic topics : • Behavioral science • Medical Sociology • Etiquette in using social medias • Self-directed learning including team learning • Medical ethics									1.5 hrs x 5 classes = 7.5 hrs

1.3. Common Classes (generic topics)

Following classes shall be conducted as common. These classes will be held from January of each session.

The duration of each class will be 1½ (one and half) hours and should be completed by 1st five consecutive classes within the time period of first term.

These classes will be organized by the supervision of Phase 1 coordinator and concerned departments and Medical Education Unit.

Sessions will be planned under the supervision of principal, vice principal, and delivered by the concerned departments.

Topic	**Duration**
Behavioral science	1.5 hr
Medical Sociology	1.5 hr
Etiquette in using social medias	1.5 hr
Self-directed learning, including team learning	1.5 hr
Medical ethics	1.5 hr

1.4. Duration of each term

i. Term I: January to May
First Term Final Exam: 1st& 2nd week of May

ii. Term II: May to October
Second Term Final Exam: 3rd & 4thweek of October

iii. Term III : November to March
Third Term Final Exam: 3rd & 4th of week of March

1.5. Cards of Phase I

Cards of the three subjects will be distributed among the three terms in the following way:

Subjects	Term I	Term II	Term III
Physiology	Cellular Physiology, Physiology of Blood Cardiovascular Physiology	Respiratory Physiology, Gastrointestinal Physiology & Renal Physiology	Endocrine Physiology, Physiology of reproduction, Neurophysiology & special senses
	Generic topics • Behavioral science • Medical Sociology • Etiquette in using social medias • Self-directed learning including team learning • Medical ethics **and** **Integrated teaching** : • Anaemia • Jaundice • Chronic Obstructive Pulmonary Disease (COPD) • Coronary artery disease	**Integrated teaching :** • Diarrhoea • Diabetes Mellitus • Proteinuria • Electrolyte imbalance	**Integrated teaching :** • Thyroid Disorder • Cerebro vascular Disease (CVD) • Deafness • Errors of refraction

Physiology Department	Anaemia, Jaundice, Chronic Obstructive Pulmonary Disease (COPD), Deafness, Errors of refraction
Biochemistry Department	Diarrhoea, Diabetes Mellitus, Proteinuria, Electrolyte imbalance, Thyroid Disorder
Anatomy Department	Coronary artery disease, Cerebro Vascular Disease (CVD)

1.6. In-course assessment

i. The Card final examination will be written only.

ii. In Term final examination (both regular & supplementary) will be written, oral & practical and it will be organized by Phase I committee.

1.7. Pre-requisite for appearing the term examination

- Students must complete all items of the cards and pass the card final examinations.
- At least 75% attendance of generic, integrated teaching and general classes
- Completion of assignment on integrated teaching.

1.8. Leave

Following leaves will be granted to the students:

i. **Pre-term:** Total 21 days, 7 days before each term (term I, II and III).

ii. **Post-term:** Total 14 days, 7 daysafter each term (term I and II). These leave may be utilized for organizing cultural week, sports, games or any other extra-curricular activities.

iii. **Preparatory leave for first Professional exam:** Total thirty (30) days preparatory leave will be granted to students before First Professional Examination.

1.9. Formative marks

Academic performances of the students must be properly documented. Calculation of Formative marks will be in the following way:

Total marks: Twenty (20) = Fifteen (15) + Five (5) marks

15 marks will be taken from the total marks obtained in three terms examination. Marks shall be calculated in the following proportion:

If a Student obtained

- 80% and above marks he/she will get 5 out of 5 in each term
- 75% to less than 80% marks he/she will get 4.5 out of 5 in each term
- 70% to less than 75%marks he/she will get 4 out of 5 in each term
- 65% to less than 70% marks he/she will get 3.5 out of 5 in each term
- 60% to less than 65% marks he/she will get 3 out of 5 in each term

Calculations

Attendance: 05 marks

- For attendance of general classes: : 2 marks
- For attendance of Integrated teaching : 2 marks
- For attendance of Generic topics: 1 mark

Calculation of marks for attendance of general classes and integrated teaching

- ≥ 90% and above : 2 marks
- 75%-89% : 1 mark

Calculation of marks for attendance of generic topics

- Mandatory: 1 mark

Calculation of lowest marks of formative assessment for an eligible student of First professional examination:

From 3 terms examination must obtained: 9 marks
From all attendance must obtained: 3 marks
Total: 9+3= 12 mark**s**

**Minimum marks to become eligible to appear in First professional examination is 12 .

Without scoring these 12 marks, students will not be eligible for first professional examination.

1.10. Pre-requisite for appearing in the First professional examination:

i) Students must pass all the term examinations. If a student fails in a term examination, he/she will have to pass the supplementary term examination.
ii) Certificate from the respective Head of Departments regarding students' attendance which must be at least 75% in all classes (lecture, practical, and tutorial, including generic topics and integrated teaching)

1.11. Summative Examination

i) Twenty (20) marks of formative assessment of each subjects will be added to the written marks of first professional examination.

ii) For MCQ (MT/F + SBA) of each paper, 20% marks are allocated. There will be separate answer script for MCQ part of examination. Total number of MCQ (MT/F+ SBA) will be 20 for each paper.

iii) For SAQ and SEQ of each paper, 70% marks are allocated.

iv) Oral part of examination will be structured.

v) OSPE will be used for assessing skills/ competencies.

vi) Pass marks in examinations is 60% of total marks. Student will have to pass in written, oral and practical examination separately.

vii) The results will be published as per following GPA system with the provision of reflection of marks in the academic transcript

Numerical Grade	Letter Grade	Grade Point
80% and above	A+	5.00
75% to less than 80%	A	4.50
70% to less than 75%	A-	4.00
65% to less than 70%	B+	3.50
60% to less than 65%	B	3.00
less than 60%	F	0.00

1.12 Examination: Distribution of marks of First Professional Examination

Subjects	Written Exam Marks	Structured Oral Exam Marks	Practical Exam Marks		Formative Exam Marks	Total Marks
Anatomy	180	150	**Soft part**75	**Hard part**75	20	500
Physiology	180	100	100		20	400
Biochemistry	180	100	100		20	400
Total						**1300**

1.13. Question setting:

Total number of paper setters must be eight (8).

i) For paper I: Four paper setters for both SAQ, SEQ and MCQ (MT/F + SBA)

ii) For paper II: Four paper setters for both SAQ, SEQ and MCQ (MT/F+SBA)

1.14. Moderation

Total number of moderators will be four (two for paper I and two for paper II).

Physiology

2:1. Departmental Objectives:

At the end of the course in physiology the MBBS students will be able to:

- Demonstrate basic knowledge on the normal functions of human body and apply it as a background for clinical subjects.
- Explain normal reactions to environment and homeostatic mechanism.
- Interpret normal function with a view to differentiate from abnormal function.
- Demonstrate knowledge & skill for performing and interpreting physiological experiments.
- Develop knowledge and skill to proceed to higher studies and research in Physiology in relation to need and disease profile of the country.
- Develop sound attitude for continuing self-education to improve efficiency & skill in Physiology.

2:2.Competencies to acquire in Physiology:

List of Competencies to acquire:

Medical courses in physiology teach the essentials of the processes of life. The physiology courses are very clinically relevant because the knowledge of the processes underlying the normal physiological functions of all the major organ systems is crucial for understanding pathology, pharmacology, and for competent clinical practice. In fact, all of medicine is based on understanding physiological functions. In the process of completing these courses, students acquire the following competencies:

- Describe transport across the plasma membrane, the basis of resting membrane potential, the genesis and propagation of action potentials. Explain muscle excitation and contraction.
- Describe the heart and circulation and how the circulatory system functions as a dual pump and dual circulatory system with the knowledge of properties of cardiac muscle, cardiac cycle, hemodynamics, heart rate and blood pressure.
- Explain respiratory processes with the knowledge of structures, ventilation, diffusion, blood flow, gas transport, mechanics of breathing, and control of ventilation.
- Identify how the kidney plays an important role in the maintenance of homeostasis by regulating both the composition and volume of ECF compartment.

- Explain how the brain works at the neuronal systems level. The role of electrical & chemical signals in information transmission & processing. Brain circulation, metabolism, neurotransmitter release & receptors,
- Describe the physiological mechanism underlying sensory perception, motor control & maintenance of homeostasis as well as higher cortical functions. Understanding autonomic nervous system.
- Describe endocrine physiology: describe the synthesis, secretion, functions & mechanism of action of the endocrine hormones.
- Explain human reproduction, functional changes in the reproductive tract, the formation of sperm & ovum, fertilization & hormonal regulation of fertility, role of hormones in pregnancy, parturition & lactation.
- The students will be able to equip themselves with adequate knowledge and develop skill for performing physiology laboratory tests and interpreting these normal functions with a view to differentiate from abnormal conditions. such as
- Measurement of blood pressure
- Examination of radial pulse.
- Recording & analysis of normal ECG (electrocardiogram) (12 Lead).
- Auscultation of heart sounds, breath sounds & bowel sound.
- Estimation of Hb concentration.
- Estimation of total count of red blood cell (RBC).
- Estimation of total and differential count of white blood cell (WBC).
- Determination of bleeding time & clotting time.
- Determination of blood grouping & cross matching.
- Determination of erythrocyte sedimentation rate (ESR).
- Determination of packed cell volume.
- Measurement of pulmonary volumes & capacities.
- Examination of urine for volume, specific gravity/osmolarity and water diuresis.
- Elicitation of reflexes (e.g., knee jerk, ankle jerk, planter response, biceps jerk, triceps jerk).
- Recording of body temperature.
- Elicitation of light reflex.
- Interpretation of Snellen’s chart and colour vision chart.
- Conduction and interpretation of Rinne test.
- Conduction and interpretation of Weber test.

2:3. Learning Objectives and Course Contents in Physiology

Cellular Physiology

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to: • Explain goal of physiology. • Explain principles of homeostasis • Describe functional organization of the human body & cell physiology. • Describe cell membrane transport. • Explain membrane potential, resting membrane potential and action potential. • Describe muscle physiology • Describe neuromuscular junction.	**CORE:** • Physiology: definition, goal & importance of physiology. • Homeostasis: definition, major functional systems, control systems and regulation of the body function. • The cell: functions of cell membrane and cell organelles. • The cell membrane transport: active & passive transport, exocytosis & endocytosis, intercellular communication, • Membrane potential: definition, basic physics of membrane potential. Resting membrane potential. • Action potential: definition & propagation of action potential. • Mechanism of skeletal muscle contraction & relaxation. • Neuromuscular junction: transmission of impulse from nerve ending to muscle fibre.	L=5 T=6 P=2

Physiology of Blood

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to: • Describe the composition & functions of blood. • Demonstrate knowledge about plasma proteins. • Demonstrate knowledge about the formation , morphology, types & functions of RBC,WBC & platelets. • Describe synthesis & breakdown of haemoglobin. • Demonstrate knowledge about the blood grouping & blood transfusion. • Describe about hemostasis & coagulation. • Describe about the bleeding disorders.	**CORE:** • Blood: composition & functions. • Plasma proteins: origin, normal values, properties, functions & effect of hypoproteinaemia • Development and normal values of formed elements. • RBC: erythropoiesis. • Hemoglobin: synthesis, types, functions & fate of hemoglobin. • Red blood cell indices, • Anaemia, Polycythemia & Jaundice: definition & classification. • WBC: Classification, morphology, properties & functions, leucocytosis, leucopenia. • Platelet: morphology & functions. • Hemostasis: definition & events. • Coagulation: definition, mechanism, • Clotting factors & fibrinolysis • Blood grouping: ABO & Rh system • Hazards of blood transfusion & Rh incompatibility. **Additional/Applied Physiology** • Bleeding disorder: thrombocytopenic purpura & hemophilia, tests for bleeding disorder	L=15 T=16 P=45 IT=06

****** IT = **I**ntegrated **T**eaching

Cardiovascular Physiology

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to : • Describe the physiology of cardiac muscle • Describe the rhythmical excitation of the heart. • Demonstrate knowledge about events of cardiac cycle. • Explain about the heart sounds. • Explain about a normal ECG. • Describe about hemodynamics. • Describe local & humoral control of blood flow by the tissues. • Describe the microcirculation, capillary fluid & interstitial fluid • Describe about cardiodynamics: cardiac output, venous return & peripheral resistance. • Explain about the heart rate & radial pulse. • Describe the regulation of blood pressure. • Demonstrate knowledge about the coronary circulation. • Demonstrate knowledge about shock • Describe the circulatory changes during exercise.	**CORE :** • Cardiac muscle: physiological anatomy, properties. • Junctional tissues of the heart: generation of cardiac impulse & its conduction. • Cardiac cycle: events, pressure & volume changes during different phases • Heart sounds: types & characteristics • ECG: principles, characteristics & interpretations • Functional classification of blood vessels & microcirculation • Interrelationship among pressure, flow & resistance. • Local & humoral control of blood flow by the tissue. • Exchange of fluid through the capillary membrane. • SV, EDV, ESV, EF: definition & factors affecting them. • Cardiac output: definition, measurement, regulation and factors affecting cardiac output. • Venous return: definition & factors affecting. • Peripheral resistance: definition & factors affecting. • Heart rate: definition, normal values, factors affecting & regulation. • Radial pulse: definition & characteristics. • Blood pressure: definition, types, measurement & regulation of arterial blood pressure. **Additional /Applied Physiology** • Circulatory adjustment during exercise. Coronary circulation • Cardiac arrhythmias: tachycardia, bradycardia & heart block • Shock: definition, classification. Physiological basis of compensatory mechanism of circulatory shock.	L=18 T=18 P=18 IT=03

Respiratory Physiology

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to : • Define pulmonary & alveolar ventilation. • Explain the mechanism of respiration • Describe pulmonary volumes and capacities, • Describe pulmonary circulation • Explain the diffusion of gases through the respiratory membrane. • Describe the oxygen & carbon dioxide transport. • Describe the respiratory centers & regulation of respiration. • Define & classify hypoxia and cyanosis.	**CORE** • Physiological anatomy of respiratory system • Respiration: definition, mechanism. • Pulmonary & Alveolar ventilation. • Pulmonary volumes and capacities (spirometry) • Dead space: definition & types • Pulmonary circulation- pressure in pulmonary system effect of hydrostatic pressure in lungs, pulmonary capillary dynamics. • Composition of atmospheric, alveolar, inspired and expired air. • Respiratory unit and respiratory membrane. • Diffusion of Gases through the respiratory membrane. • Transport of Oxygen & Carbon dioxide in blood & body fluid. Oxy-hemoglobin dissociation curve. Bohr effect, Haldane effect & chloride shift mechanism. • Respiratory centers: name, location & functions. • Nervous & chemical regulation of respiration. • Lung function tests: name, significance • Ventilation -perfusion ratio. • Regulation of respiration during exercise. • Hypoxia: definition, types • Cyanosis: definition & types. • **Additional/Applied Physiology** • Oxygen therapy in hypoxia • Definition of dyspnea, hypercapnea & periodic breathing.	L=12 T=14 P=08 IT=03

Renal Physiology

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to: • Describe the structure & function of nephron. • Describe the mechanism of urine formation. GFR, tubular reabsorption, tubular secretion. • Describe the mechanism of water balance and osmotic diuresis. • Explain physiological mechanism of micturition.	**CORE:** • Kidney: functions • Nephron: types, parts, structure & functions • Renal circulation: peculiarities & functional importance • Urine formation: basic mechanism • GFR: definition, determinants, measurement, control of GFR & regulation of renal blood flow • Reabsorption and secretion by the renal tubules • Definition of Tm, Renal threshold, tubular load & plasma load, plasma clearance and diuresis, • Mechanism of formation of concentrated urine & diluted urine. • Micturition reflex **Additional /Applied Physiology** Abnormalities of micturition	L= 12 T= 10 P= 02 IT=06

Gastrointestinal Physiology

Learning Objectives	Contents	Hours / day
Gastrointestinal Physiology At the end of the course the students will be able to: • Describe the general principles of gastrointestinal function. • Describe the movements of GIT	**CORE:** • Phygiological anatomy of gastrointestinal (GI) tract. • Enteric nervous system. • Local hormones of GIT: name, function & regulation of secretion • Hormonal control of GI function. • Movements of the GIT. • GI reflexes. • Functions of stomach, small intestine and large intestine **Additional / Applied Physiology** Pyloric pump	L=10 T=8 P=02 IT=03

Endocrine Physiology and Physiology of Reproduction

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to: • Describe types, hormonal receptors & general mechanism of action of hormone. • Describe functions, mechanism of action & regulation of secretion of individual hormone. • Describe disorders in relation to pituitary gland, thyroid and parathyroid gland, adrenal gland and endocrine pancreas	**CORE :** • Endocrine glands : name & name of their hormones. • Hormone: definition, classification, mechanism of action, assessment of hormone level. • Hypothalamic hormones, releasing & inhibitory hormones: name and functions. • Pituitaty Gland: physiological anatomy. • Pituitary hormones (anterior & posterior): name, functions, mechanism of action and their control by the hypothalamus and disorders (dwarfism, gigantism, acromegaly & hypopituitarism and diabetes insipidus). • Thyroid Gland: physiological anatomy. • Thyroid hormones: biosynthesis, transport, functions, mechanism of action, regulation of secretion, disorders (hypo and hyperthyroidism, cretinism, myxoedema and goitre).. • Parathyroid Gland: physiological anatomy. • Parathyroid hormone: functions, mechanism of action & regulation of secretion. • Adrenal Gland: physiological anatomy. Adrenocortical hormones: name, functions , mechanism of action , regulation of secretion & disorders (Addison's disease, Cushing's Syndrome, Conn's disease). • Islets of Langerhan's of pancreas - hormones: functions, mechanism of action & regulation of secretion **Additional / Applied Physiology** Pathophysiology of insulin deficiency.	L=20 T=20 P=02 IT=06

Physiology of Reproduction

Learning Objectives	Contents	Hours / day
Physiology of Reproduction **At the end of the course the students will be able to :** • Describe male & female reproductive organs & their hormones • Describe spermatogenesis • Explain about functions of testosterone, oestrogen and progesterone • Describe ovulation, ovarian & menstrual cycle • Demonstrate knowledge about puberty • Explain about lactation	• Introduction to reproductive physiology, sex determination & sex differentiation. Puberty • Functional anatomy of male reproductive system • Secondary sex characteristics of male • Testes: functional structure and functions • Testosterone: function. • Spermatogenesis: steps & hormonal control. • Functional anatomy of female reproductive system • Secondary sex characteristics of female • Ovaries : functional structure and functions. Functional structure of uterus. • Menstrual cycle: definition, phases and hormonal control. • Ovarian cycle: phases and hormonal regulation. • Ovulation: definition, mechanism & hormonal control. • Definition of menstruation, menarche & menopause. • Ovarian hormones • Functions of oestrogen and progesterone. • Placental hormones: name & functions. • Mammogenesis: development and lactation. **Additional/Applied Physiology** • Indicators of ovulation. • Anovulatory cycle. , Cushing's Syndrome, Conn's disease).	

Neurophysiology

Learning Objectives	Contents	Hours / day
At the end of the course the Students will be able to: • explain organization of the nervous system • explain the basic mechanism of synaptic transmission. • describe the sensory system of the body. • describe the organization and functions of the spinal cord. • explain the spinal cord reflexes. • describe the motor control system-pyramidal and extra pyramidal systems. • describe the functions of cerebellum. • describe functions of basal ganglia, thalamus, reticular formation & limbic system • describe functions of hypothalamus • describe organization & function of autonomic nervous system	**CORE:** • Functional organization of nervous system and functions of major levels of central nervous system(CNS). • **Neuron:** definition, parts, types • **Nerve fiber:** classification, properties, effects of injury/section to the nerve fiber • **Synapse:** physiological anatomy, properties, types, synaptic transmission • **Neurotransmitters:** definition, types, functions • **Sensory receptor:** definition, classification, properties, receptor potential. • **General/somatic senses:** definition, classification • **Ascending tracts/sensory pathways:** name & function. • Spinothalamic tract, tract of Gall, tract of Burdach, spinocerebellar tract : origin, course, termination & function. • **Cerebral cortex:** name & functions of the Brodmann's areas • **Reflex:** definition, classification, properties, • **Reflex arc:** definition, components • Stretch reflex, withdrawal reflex, crossed extensor reflex, reciprocal innervation & planter response. • **Muscle spindle**: definition, physiological anatomy, functions. • **Muscle tone**: definition, function, maintenance • **Descending tracts / motor pathways:** name & function. • Pyramidal tract: origin, course, termination, function & effect of lesion. • Extrapyramidal tract: name, functions. • Upper motor neuron and Lower motor neuron: definition, example, effect of lesion. • Spinal cord: hemisection.	L=18 T=18 P=08 IT=03

Neurophysiology
(Contd.)

Learning Objectives	Contents	Hours / day
	• **Cerebellum:** functional division, functions, error control mechanism of motor activity & cerebellar disorder. • **Basal ganglia:** functional components, functions & effects of lesion • **Thalamus, Reticular formation, limbic system:** components & functions. • **Hypothalamus:** name of the nucleus and functions • **Autonomic Nervous system:** components and functions **Additional/Applied Physiology** • Pain: types, dual pathway for transmission of pain, referred Pain. • Thermostatic function of hypothalamus. • Posture, equilibrium: definition, name of the areas controlling them. • Sleep, memory: definition, name of the areas controlling them. • Alarm or stress response.	

Physiology of Body Temperature

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to: • Describe the physiology & regulation of body temperature.	**CORE :** • Normal body temperature, site of measurement, sources of heat gain, channels of heat loss, regulation of body temperature in hot and cold environment. **Additional/Applied Physiology** • Heat stroke, hypothermia, frost bite, fever.	L=02 T=02 P=02

Physiology of Special Senses

Learning Objectives	Contents	Hours / day
At the end of the course the students will be able to: • Describe the neurophysiology of vision and visual pathway • Explain errors of refraction, accommodation reaction, light reflexes, dark and light adaptation. • Explain mechanism of hearing and describe auditory pathway • Describe the physiology of smell and taste	**CORE:** • **Vision :** physiological anatomy of eye, image formation in the eyes, visual receptors, visual pathway, common refractive errors, photochemistry of vision, accommodation reaction, light reflex , dark & light adaptation, Field of vision, color vision, color blindness, visual acuity. • **Hearing:** auditory apparatus, receptor, mechanism of sound wave transmission, auditory pathway. • **Smell:** smell receptors, olfactory pathway. • **Taste:** taste receptors, modalities of taste sensation, taste pathway. **Additional/Applied Physiology** • Effects of lesion in visual pathway. • Argyll Robertson pupil, Horner's syndrome.	L=08 T=08 P=08 IT=06

Physiology Practical

Learning Objectives	Contents	Hours / day
CELLULAR PHYSIOLOGY & PHYSIOLOGY OF BLOOD **Students will be able to** • Demonstrate knowledge on common laboratory equipments used for practical hematology. • Perform common hematological tests. • Interpret results for practical purpose.	**CORE:** • Developing skill in using of microscope & common laboratory equipments. • Collection & preparation of blood sample. • Observation of osmotic behavior of RBC • Determination of total count of RBC, • Determination of total count of WBC • Determination of differential count of WBC. • Estimation of haemoglobin. • Observation of osmotic fragility of RBC. • Determination of ESR • Determination of PCV. • Determination of Blood grouping (ABO & Rh system) & cross matching. • Determination of bleeding time & clotting time. • Interpretation of Red Cell Indices	02 45
CARDIOVASCULAR PHYSIOLOGY **Students will be able to :** • examine the radial pulse & its application. • measure the blood pressure and effect of exercise on it. • auscultate 1st & 2nd heart sounds. • record & analysis of normal ECG.	**CORE :** • Measurement of Blood Pressure & effect of exercise on it. • Auscultation of 1st & 2nd heart sounds. • Examination of radial pulse. • Recording & analysis of normal ECG (12 leads).	18

RESPIRATORY PHYSIOLOGY **Students will be able to :** examine the Respiratory system perform lung function tests & interpret tests on clinical conditions. demonstrate the knowledge about breath sounds.	**CORE:** Examination of respiratory system (physiological aspect) Counting of respiratory rate. Auscultation of breath sounds. Determination of lung function tests including Spirometry.	08
GASTROINTESTINAL PHYSIOLOGY **Students will be able to:** auscultate the intestinal sound	**CORE** Auscultation of intestinal sound	02
RENAL PHYSIOLOGY **Students will be able to:** Determine the specific gravity of urine	**CORE** Determination of specific gravity of urine	02
NEUROPHYSIOLOGY **Students will be able to :** examine the sensory & motor functions of human body. elicit the reflexes & interpret its clinical importance.	**CORE :** Examination of motor & sensory functions. Elicitation of the reflexes & interpretation of its clinical importance. (knee jerk, biceps jerk, triceps jerks & planter response).	10
PHYSIOLOGY OF BODY TEMPERATURE **Students will be able to** record the body temperature	**CORE:** Recording of the body temperature. Observation of the effect of exercise on body temperature.	**02**
PHYSIOLOGY OF SPECIAL SENSES **Students will be able to :** perform the light reflex & accommodation reaction perform visual acuity & color vision. conduct tests for hearing & interpret the result	**CORE:** Observation of Light reflex, Interpretation of visual acuity and color vision. Conduction and interpretation of Rinne test & Weber test.	08

2.4a. Distributions of teaching /learning hours

Lecture	Tutorial	Practical	Total Teaching hours	Integrated teaching for 1st Phase	Formative Exam		Summative exam		Total days for preparation & exam.
					Preparatory leave	Exam time	Preparatory leave	Exam time	
120 hrs	120 hrs	97 hrs	340 hrs	36hrs	35 days	42 days	30days	30 days	137 days
(Time for exam. preparatory leave and formative & summative assessment is common for all subjects of the phase)									

2:4b. Distribution of Teaching Hours

Systems	Lecture hours	Tutorial hours	Practical hours	Integrated teaching hours
1. Cellular Physiology	5	6	2	-
2. Physiology of blood	15	16	45	06
3. Cardiovascular Physiology	18	18	18	03
4. Respiratory Physiology	12	14	8	03
5. Gastrointestinal Physiology	10	8	2	03
6. Renal physiology	12	10	2	06
7. Endocrine Physiology & Physiology of Reproduction	20	20	2	06
8. Neurophysiology & body temperature regulation	20	20	10	03
9. Physiology of Special Senses	08	8	8	06
Total	120	120	97	36

2.5. Teaching/learning methods, teaching aids and evaluation

Teaching Methods			Teaching aids	In course evaluation
Large group	**Small group**	**Self-learning**		
Lecture Integrated teaching	Tutorial Practical Demonstration	• Assignment • Self assessment • Self -study	• Computer, Multimedia & other IT materials • Chalk & board • White board & markers • OHP • Slide projector • Flip Chart • Models • Specimens • projector • Study guide & manuals.	• Item examination(oral) • Practical item examination(Oral & practical) • Card completion Examination (Written only) • Term final Examination(Written, oral & practical)

2.6. Time allocation in Physiology in different terms

Term	Lecture hours	Tutorial hours	Practical hours	Integrated teaching hours	Total hours
1st Term	38	40	35	12	113
2nd Term	34	32	32	12	98
3rd Term	48	48	30	12	126
Grand Total	120	120	97	36	337

2.7. Academic Calendar for Physiology

		1st Term		2rd Term		3rd Term	
Teaching /Learning Method	**Teaching hours including Examination**	20 Working weeks	**EVALUATION**	20 Working weeks	**EVALUATION**	20 Working weeks	**EVALUATION**
Lecture	120 Hours	Cellular Physiology- 05 hours Blood—15 hours Cardiovascular Physiology- 18 hours		Resp. Physiology—12 hours Gastrointestinal Physiology —10 hours Renal Physiology- 12 hours.		Endocrine & Reproduction—20 hours Nervous system &Body temp.—20 hours. Special Senses-08 hours.	
Tutorial	120 hours	Cellular Physiology —06 hours. Blood –16 hours. Cardiovascular Physiology —18 hours.		Respiration—14hours. GIT—08 hours. Renal —10hours.		Endocrine & reproduction—20 hours. Nervous system & Body temp. –20 hours Special Senses—08 hours.	
Practical	97 hours.	Cellular Physiology—02 hours. Blood—33 hours.	**4 WEEKS**	Blood—12 hours CVS---18hours. GIT—02 hours	**4 WEEKS**	Respiration- 08 hours Renal – 02 hours Endocrine—02 hours Neurophysiology -08 hours Body temp—**02** hours Special Senses--08 hours	**7 WEEKS**

3. Overview of Assessment in 1st Professional Examination

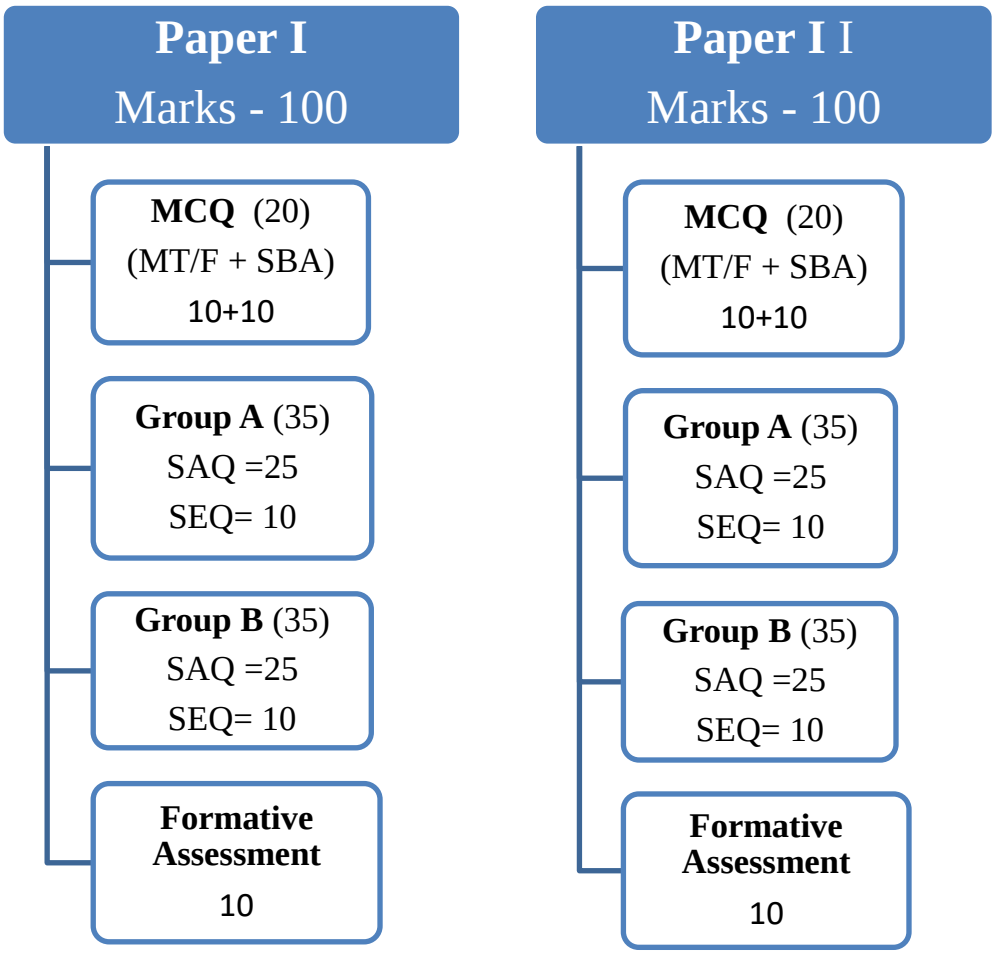
Written	Oral	Practical
(Total marks – 200)	Total marks – 100)	(Total marks- 100)

Grand total – 400, pass marks- 60% in each part i.e. in written, oral and practical

3.1. Assessment systems and marks distribution

Components	Marks	Total Marks	Contents
WRITTEN EXAMINATION Paper – I- Formative Assessment + MCQ + SAQ+ SEQ Paper – II- Formative Assessment + MCQ + SAQ+ SEQ	10+20+70 = 100 10+20+70 =100	200	**Paper – I** 1. Cellular Physiology 2. Physiology of blood 3. Cardiovascular Physiology 4. Respiratory Physiology 5. Gastrointestinal Physiology **Paper – II** 1. Renal physiology 2. Endocrine physiology & Physiology of Reproduction 3. Neurophysiology &Temperature regulation 4. Physiology of Special senses
PRACTICAL EXAMINATION OSPE Traditional practical methods and experiments Practical Note Book Assignment on Integrated Teaching	40 40 10 10	100	
STRUCTURED ORAL EXAMINATION (SOE) 2 boards	Board – I = 50 Board – II = 50	100	
Grand Total		400	

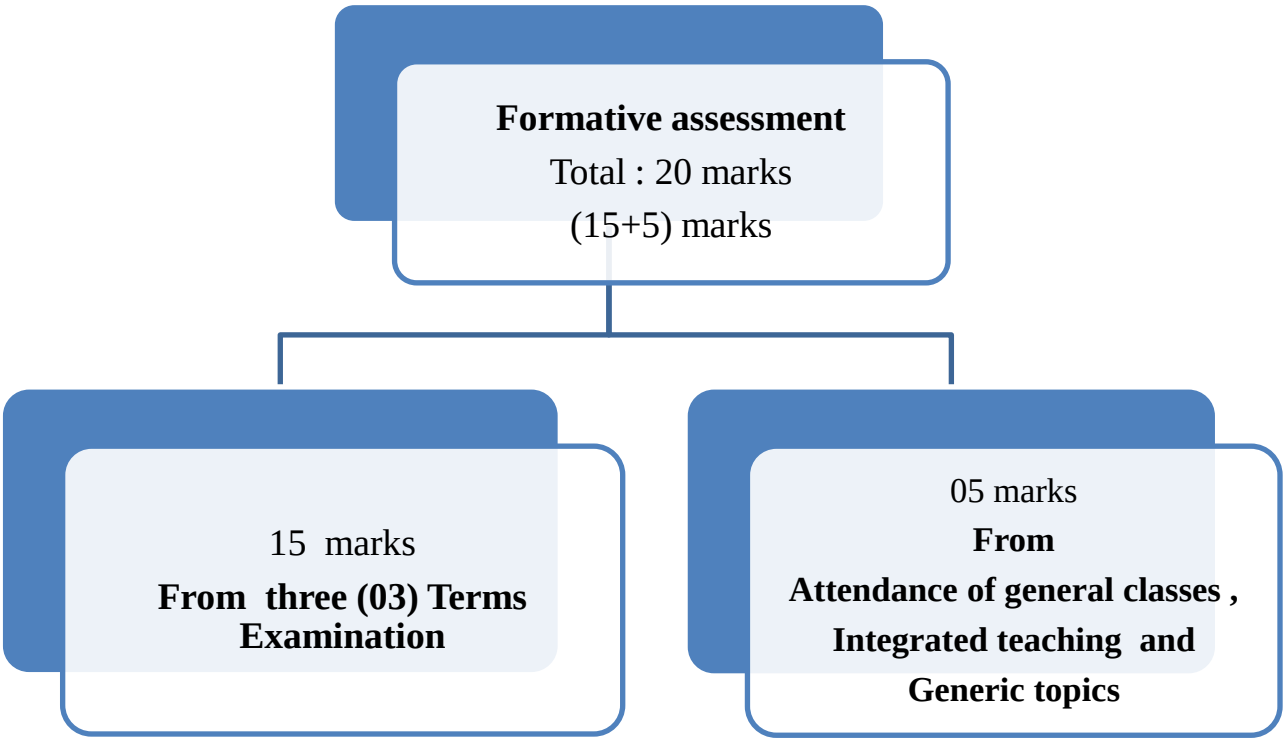
WRITTEN EXAMINATION



3. 2.Written examination:

3.2.1 Formative assessment:

Distribution of marks in formative assessment:



- Marks of formative assessment are on the basis of three terms examination and percentage of attendance.
- Head of the department will keep the records of formative assessment of the students.
- It is the responsibility of the Convener of the examination to send the calculated marks of formative assessment to the controller of examination signed by all the four (2 internals+ 2 externals) examiners.

15 marks will be taken from the total marks obtained in three terms examination. Marks shall be calculated in the following proportion:

If a Student obtained

- 80% and above marks he/she will get 5 out of 5 in each term
- 75% to less than 80% marks he/she will get 4.5 out of 5 in each term
- 70% to less than 75%marks he/she will get 4 out of 5 in each term
- 65% to less than 70% marks he/she will get 3.5 out of 5 in each term
- 60% to less than 65% marks he/she will get 3 out of 5 in each term

Attendance: 05 marks

- For attendance of general classes: : 2 marks
- For attendance of Integrated teaching : 2 marks
- For attendance of Generic topics: 1 mark

Calculation of marks for attendance of general classes and integrated teaching

- ≥ 90% and above : 2 marks
- 75%-89% : 1 mark

Calculation of marks for attendance of generic topics

- Mandatory: 1 mark

3.2.2 Multiple choice questions (MCQ) for each paper:

- For MCQ time allocation is 30 minutes for 20 questions.
- Each stem will carry one mark.
- Among the 20 questions (10 questions will be Multiple True/False (MT/F Type**)** and 10 questions will be Single Best Answer (SBA type).

In case of Multiple True/False (MT/F type)

- Each question will carry 1 (one) stem and 5 (five) alternatives.
- Each alternative will carry 0.2 marks.
- OMR sheet will be supplied for answering MCQ questions of MT/F and SBA type.
- No negative marking for MCQ.
- MCQ will be checked centrally by digital process.

In case of Single Best Answer (SBA type)

- Each question will carry one (1) stem and four (4) alternatives.
- Most appropriate answer will be considered as correct answer.
- Single correct answer will carry one (1) mark.
- Instruction: Fill up the single circle for the best answer.

Example of a MCQ (MT/F type):

Fill up the "T" circle for true and "F" circle for false in the OMR sheet provided

Example of MCQ (MT/F type) :

Hormone that acts by gene activation includes

a) Thyroxine
b) Oxytocin
c) Aldosterone
d) Cortisol
e) Calcitonin

Example of MCQ (SBA type) :

A young male in hemorrhagic shock due to road traffic accident: which of the following organ is specially vulnerable during shock phase in this patient?

- Brain
- Heart muscle
- Kidney
- Skeletal muscle

3.2.3 Short Answer Questions (SAQ):

- There will be two groups in each paper, group A and group B.
- SAQ question will carry 5 marks
- Question 1-5 are SAQ type in Group A and Question 8-12 are SAQ type in Group B in each paper.
- Total four (04) SAQ should be answered out of five (05) questions from each group.
- Question 6 in Group A and Question 13 in Group B will be mandatory problem based question (PBQ) of SAQ type in each paper.
- Problem based question (PBQ), which will carry 5 marks.
- Allocated time for answering SAQ and SEQ is two (2) hours and thirty (30) minutes.

Type of Questions

- ❖ Recall type – 50%
- ❖ Understanding type – 35%
- ❖ Problem based / Analytical type – 15%

Example of question for SAQ:

Q. : Name the essential blood coagulation factors. (Recall)

Write down the basic steps of coagulation. (Recall)

Why is coagulation time increased in hemophilia ? (Understanding)

(1+2+2)

Q. : What are the tests to be done in an young boy with bleeding disorder? Justify your answer. (Problem based) Marks 5

3.2.4 Structured Essay Questions (SEQ):

- Question no. 7 in Group A and Question no. 14 in Group B are compulsory **(SEQ type)**
- Each question will carry 10 marks.
- There shall be alternative question for Question no.7 and 14 in each paper.

Example of question for SEQ:

- Q: Describe the oxygen transport from lung to tissue mentioning the form of transport, changes in PO_2 and relationship of percent saturation of hemoglobin with partial pressure of oxygen by using diagram. (Marks 10)

Question setting format

Group A		**Group B**	
Question no. 1-5	**SAQ type** (5 marks each)	**Question no. 8-12**	**SAQ type** (5 marks each)
Question no. 6	**PBQ type (mandatory)** (5 marks)	**Question no. 13**	**PBQ type (mandatory)** (5 marks)
Question no. 7	**SEQ type** (10 marks)	**Question no. 14**	**SEQ type** (10 marks)

Distribution of topics of groups in Paper I and Paper II (SAQ, SEQ and MCQ) in 1st professional examination:

Paper I		**Paper II**	
Group A	**Group B**	**Group A**	**Group B**
Topics: i. Cellular Physiology ii. Physiology of Blood iii. Gastrointestinal Physiology	**Topics:** i. Respiratory Physiology ii. Cardiovascular Physiology	**Topics:** i. Renal Physiology ii. Endocrine Physiology & Physiology of Reproduction	**Topics:** i.Neurophysiology & Body temperature regulation ii) Physiology of Special senses

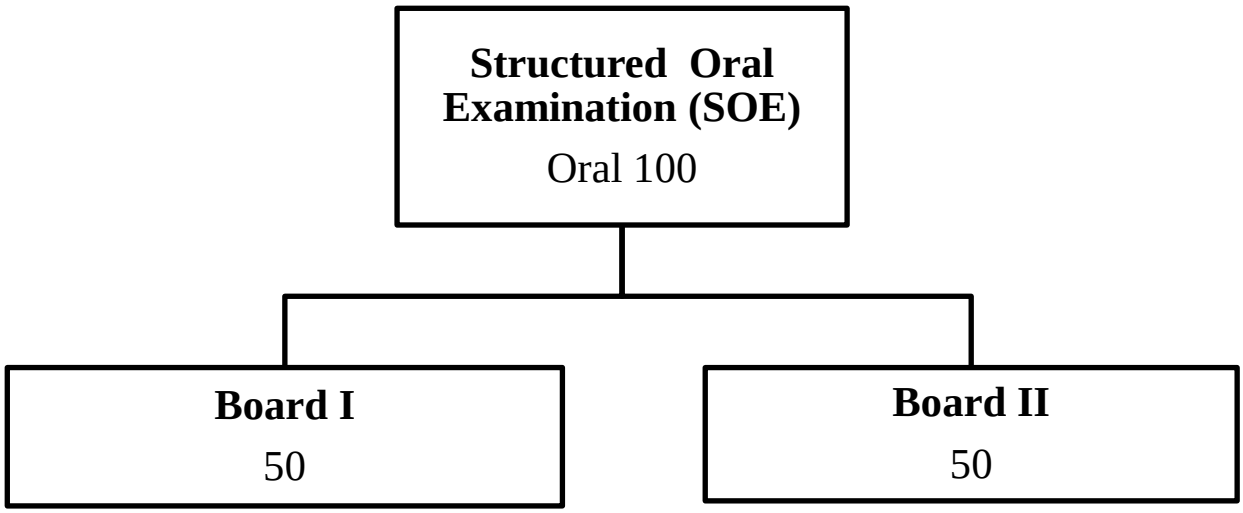
Distribution of written scripts among the examiners:

- There will be four examiners- two internals and two externals.
- Paper I, group A has to be examined by one internal examiner and Paper I, group B by one external examiner.

- Paper II, group A has to be examined by other internal examiner and Paper II, group B by other external examiner.
- Group A and B will be according to the serial of the name of examiners in examiner's list.

3:3. Structured Oral Examination (SOE)

- Number of oral examination board will be two (Board I and Board II).
- Number of examiners in each board will be two: one internal and one external.
- SOE must be structured.
- For each Board marks are fifty (50).
- Number of questions for each Board is ten (10).
- Allocation of marks for each question is five (5).
- For SOE, the ideal pattern of questions are as follows:
    - ❖ Recall –50%
    - ❖ Understanding–35%
    - ❖ **Problem based /Analytical –15%**
- Topics of paper I and paper II should be distributed between two boards.
- Systems of paper I will be included in Board I and paper II will be in Board II. Systems must be exchanged between two boards on every alternate day for better evaluation.
- In each day, maximum fourteen numbers of students should be scheduled for oral and practical examination.
- In the same day, each student will face both oral (Board I & Board II) examination and practical examination.



Distribution of systems for board I and board II of Structured oral examination (SOE) in 1st professional examination:

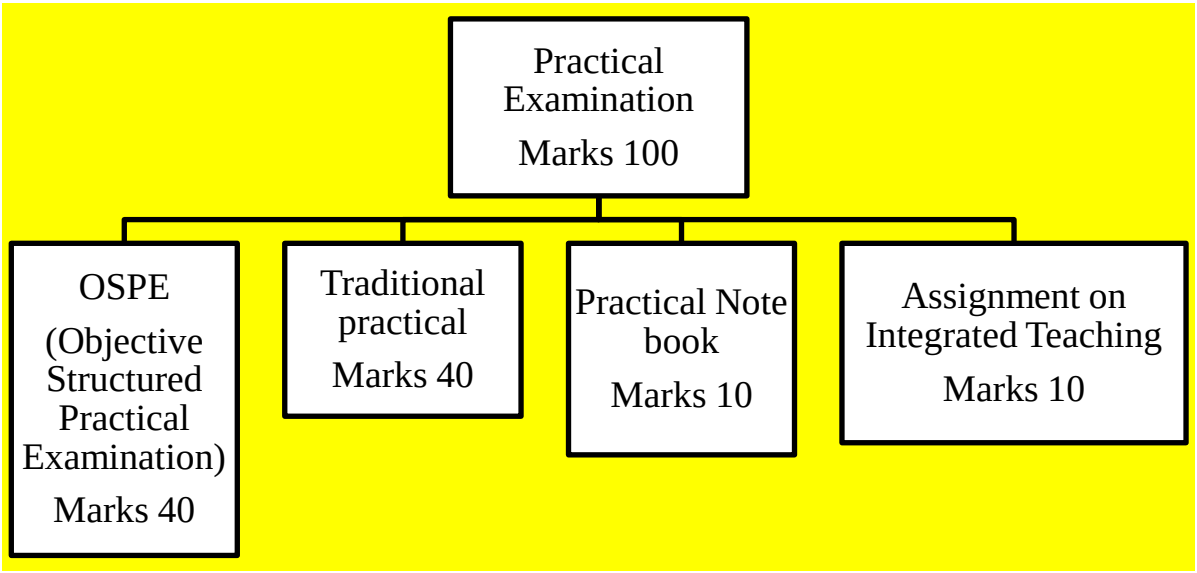
Paper I/ Board I	Paper II/ Board II
1. Cellular Physiology	1. Renal Physiology
2. Physiology of Blood	2. Endocrine Physiology
3. Cardiovascular Physiology	3. Physiology of Reproduction
4. Respiratory Physiology	4. Neurophysiology& Temperature regulation
5. Gastrointestinal Physiology	5. Physiology of Special senses

3:4. Practical examination:

I. Objective structured practical examination (OSPE):

- Number of stations in OSPE is ten (10).
- Number of procedure station is four (4).
- Number of question station is six (6).
- Allocation of time for each station is two (2) minutes.
- Allocation of marks for each station is four (4).

- External and internal examiners must be the observers in the procedure station.
- OSPE questions have to be prepared and conducted by both the internal and external examiners.
- Answer scripts of OSPE will be examined by four ; two external and two internal examiners.



II. Traditional Practical examination:

- Experiments of traditional practical examination will be according to the curriculum.
- Practical examinations will be conducted by all the four (two internal and two external) examiners.
- One experiment should be given to each student.

III. Practical Notebook:

- Total number for practical note book is ten (10).
- Marks will be given by the internal examiner.

IV. Assignment on Integrated teaching

- Preferably based on SEQ type question with a component of take home message
  from each topic of integrated teaching.
- Total number is ten (10).

4. Post Examination Procedure

Preparation and submission of marks sheet

Marks sheet of formative, oral and practical examination should be sent to the Controller of examination by the Convener of the examination.

- **Written**
- **Formative**
  - Formative marks should be sent to the Controller of examination in a separate marks sheet.
  - Marks sheet should be signed by all four (two external and two internal) examiners
- **SAQ and SEQ**
  - Marks of short answer question and structured essay question of each group should be submitted by all four examiners to controller of examination within three (03) days of completion of oral and practical examination schedule.
- **MCQ**
  - Multiple choice questions will be checked centrally by OMR machine.
  - OMR sheets should be packed and sealed properly by hall superintendent of written examination and will be submitted to the Head of the center.
  - The Head of the center will send the packet of OMR sheet to the Controller of examination.
- **Practical**
  - Total practical marks (OSPE+ Traditional Practical + Practical note book + Assignment on Integrated teaching) will be submitted to controller of examination in a separate mark sheets signed by four examiners (two internal + two external).
- **Oral**
  - Mark sheets of oral examination should be signed by all the four (two internal + two external) examiners and will be submitted to the controller of examination.

5. Students In-Course Evaluation Cards

5:1.Card for Card final& Term final examination on Physiologyfor individual student

Department of Physiology

Students name---------- Roll no.----------

Session ---------- Year---------- Batch----------

Date of starting ---------- Date of ending ----------

Components	Written		Oral		Practical		Remarks (Signature & Date)
	Full Marks	Marks Obtained	Full Marks	Marks Obtained	Full Marks	Marks Obtained	
Cellular physiology & Physiology of Blood	100						
Cardiovascular Physiology	100						
Respiratory physiology	100						
Gastrointestinal Physiology& Renal Physiology	100						
Endocrine Physiology, Physiology of Reproduction	100						
Neurophysiology, Body temperature regulation, Physiology of Special Senses	100						
1st Term	**100**		**100**		**100**		
2nd Term	**100**		**100**		**100**		
3rd Term	**100**		**100**		**100**		

5:2. Class Attendance Record

Department of Physiology

Components	Total Class held	Total Class attended	Percentage (attended/ Held)	Remarks (Signature & Date)
Lecture (120 hours)				
Tutorial (120 hours)				
Practical (97 hours)				
Integrated teaching (36 hours)				
Generic topics (75 hours)				

5.3 Continuous Assessment Cards

Continuous Assessment Card

Department of Physiology---------- Medical college----------
Students name---------- Roll no.----------
Session ---------- Year ---------- Batch ----------
Date of starting ---------- Date of ending ----------

Card 1: (Cellular Physiology & Blood)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (signature & Date)
1.	Definition, goal & importance of physiology. Homeostasis: definition, major functional systems, control systems of the body	10		
2.	The cell: functions of cell membrane & cell organelles.	10		
3.	The cell membrane transport: active & passive transport, exocytosis & endocytosis. Intercellular communications	10		
4.	Membrane potential: definition and basic physics of membrane potential. Resting membrane potential Nerve Action potential & propagation of action potential.	10		
5.	Neuromuscular junction, muscle contraction & transmission of impulse from nerve ending to the muscle fibre.	10		
6.	Composition & functions of blood, Plasma proteins: Origin, normal values, properties & functions.	10		
7.	RBC: normal count, morphology, functions, erythropoiesis, fate of RBC. Hemoglobin: synthesis, types, functions. Red blood cell indices. Anaemia: definition & classification Polycythemia: definition & type. Jaundice: definition & classification	10		
8.	WBC: classification with normal count, morphology, development, properties & functions. leucocytosis, leucopenia .	10		
9.	Platelets: normal count, morphology, functions & development. Hemostasis: definition & events Coagulation: definition, blood clotting factors . Mechanism of coagulation & fibrinolysis. Anticoagulant: name, mode of action. Bleeding disorder: thrombocytopenic purpura & hemophilia. Tests for bleeding disorder: bleeding time, coagulation time and prothrombin time.	10		
10.	Blood grouping: ABO & Rh system, hazards of blood transfusion & Rh incompatibility.	10		

Signature of Batch Teacher :

Signature of Head of Department

Continuous Assessment Card

Department of Physiology---------- **Medical college**----------

Students name---------- **Roll no.**----------

Session ---------- **Year** ---------- **Batch** ----------

Date of starting ---------- **Date of ending** ----------

Card 2: (Cardiovascular Physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (signature & Date)
1.	Properties of cardiac muscle. Junctional tissues of the heart. Generation of cardiac impulse & its conduction in the heart.	10		
2.	Cardiac cycle: definition, events, pressure & volume changes during different phases of cardiac cycle. Heart sounds : type, characteristics and their significances ECG : definition, principles and interpretations	10		
3.	Functional classification of blood vessels, interrelationship among pressure, flow & resistance. Local & humoral control of blood flow in the tissues. Exchange of fluid through the capillary membrane.	10		
4.	SV, EDV, ESV: definition & factors affecting them. Cardiac output : definition, measurement, regulation and factors affecting cardiac output. Venous return: definition & factors affecting. Heart rate: factors affecting & regulation. Pulse: definition, characteristics	10		
5.	Peripheral resistance: definition & factors affecting. Blood pressure: definition, types, measurement & regulation of arterial blood pressure.	10		
6.	Circulatory adjustment during muscular exercise Cardiac arrhythmias : tachycardia, bradycardia. Heart block: definition and types Shock: definition, classification. Physiological basis of compensatory mechanism of circulatory shock.	10		

Signature of Batch Teacher :

Signature of Head of Department

Continuous Assessment Card

Department of Physiology---------- **Medical college**----------

Students name---------- **Roll no.**----------

Session ---------- **Year** ---------- **Batch**-----

Date of starting ---------- **Date of ending** ----------

Card 3: (Respiratory Physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (signature & Date)
1.	Respiration: definition, mechanism. Pulmonary & Alveolar ventilation. Pulmonary volumes and capacities(spirometry) Dead space: physiological & anatomical Lung function tests :name & significance	10		
2.	Composition of atmospheric, alveolar, inspired and expired air. Respiratory unit and respiratory membrane. Diffusion of Gases through the respiratory membrane. Peculiarities of pulmonary circulation Ventilation -perfusion ratio.	10		
3.	Transport of Oxygen & Carbon dioxide in blood. Oxy-hemoglobin dissociation curve. Bohr effect, Haldane effect & Chloride shift.	10		
4.	Respiratory centers: name, location & functions. Nervous & chemical regulation of respiration. Regulation of respiration during exercise.	10		
6.	Hypoxia: definition, types Cyanosis: definition & types. Definition of dyspnea, hypercapnea& periodic breathing.	10		

Signature of Batch Teacher :

Signature of Head of Department :

Continuous Assessment Card

Department of Physiology---------- **Medical college**----------

Students name---------- **Roll no.**----------

Session ---------- **Year** ---------- **Batch** ----------

Date of starting ---------- **Date of ending** ----------

Card 4 : (Gastrointestinal Physiology & Renal physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (Signature & Date)
1.	Physiological anatomy ofgastrointestinal (GI) tract. Enteric nervous system. Local hormones of GIT: name, functions & regulation of secretion Neural and hormonal control of GI function.	10		
2.	Movements of the GIT. GI reflexes.	10		
3.	Kidney: functions of kidneys. Renal circulation: peculiarities with functional importance.	10		
4.	Urine formation Glomerular filtration, determinants of GFR, Autoregulation of renal blood flow and GFR.	10		
5.	Reabsorption and secretion by the renal tubules .$T_{m,}$ Renal threshold, tubular load & plasma load.	10		
6.	Mechanism of formation of concentrated & dilute urine.	10		
7.	Micturition reflex Abnormalities of micturition	10		

Signature of Batch Teacher :

\ Signature of Head of Department :

Continuous Assessment Card

Department of Physiology,---------- **Medical college----------**

Students name---------- **Roll no.----------**

Session ---------- **Year ---------- Batch ----------**

Date of starting ---------- **Date of ending ----------**

Card 5 : (Endocrine Physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks
1.	Endocrine glands: name Hormones: definition, classification, mechanism of action, regulation of secretion	10		
2.	Hypothalamic hormones. Pituitary hormones (anterior & posterior): name, functions and their control by the hypothalamus and disorders (Dwarfism, gigantism, acromegaly & hypopituitarism and diabetes insipidus)	10		
3.	Thyroid hormones: biosynthesis, transport, functions, regulation of secretion, disorders (Hypothyroidism hyperthyroidism, Cretinism, Myxoedema and goitre). .	10		
4.	Parathyroid hormone: functions, mechanism of action & regulation of secretion.	10		
5.	Adrenocortical hormones: name, functions , mechanism of action , regulation of secretion & disorders (Addison's disease, Cushing's Syndrome, Conn's disease).	10		
6.	Hormones of Islets of Langerhan's of pancreas: functions , mechanism of action, regulation of secretion & disorders	10		

Signature of Batch Teacher:

Signature of Head of the Department:

Continuous Assessment Card

Department of Physiology,---------- **Medical college----------**

Students name---------- **Roll no.----------**

Session ---------- **Year ---------- Batch ----------**

Date of starting ---------- **Date of ending ----------**

Card 6: (Physiology of Reproduction)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks
1.	Introduction to reproductive physiology, sex determination & sex differentiation. Puberty Functional anatomy of male reproductive system. Secondary sex characteristics of male Gonad : functional structure and functions of testes. Testosterone: functions, Spermatogenesis: steps & hormonal control.	10		
2.	Functional anatomy of female reproductive system. Secondary sex characteristics of female Gonad : functional structure and functions of ovaries. Functional structure of uterus Menstrual cycle: definition, hormonal control Ovarian and endometrial cycle with their hormonal regulation. Ovulation: definition, mechanism & hormonal control. Indicators of ovulation Definition of menstruation, menarche & menopause. Ovarian hormones Oestrogen and progesterone: functions	10		
3.	**Physiology of pregnancy & Lactation:** Pregnancy: physiological changes during pregnancy. Placental hormones: name & functions. Mammogenesis: hormonal influence for mammogenesis& lactation Physiology of contraception	10		

Signature of Batch Teacher:

Signature of Head of the Department:

Continuous Assessment Card

Department of Physiology---------- **Medical college**----------
Students name---------- **Roll no.**----------
Session ---------- **Year** ---------- **Batch** ----------
Date of starting ---------- **Date of ending** ----------

Card 7: (Neurophysiology & special senses)

Sl. No	Name of item	Full Marks	Marks Obtained	Remarks & signature
1.	Functional organization and functions of major levels of central nervous system(CNS). **Neuron:** definition, parts, types **Nerve fiber**: classification, properties, effects of injury to the nerve fiber **Synapse**: physiological anatomy, type, properties & synaptic transmission **Neurotransmitters**: definition, types & functions	10		
2.	**Sensory systems of the body:** **Sensory receptor**: definition, classification, properties, receptor/generator potential. **Cerebral cortex :**Name and functions of the Brodmann's areas. **General/somatic senses:** definition and classification. **Ascendingtracts/sensory pathways** – name.(Tract of Gall &Burdach, spinothelamic tract, spinocerebellar tract): origin, course, termination, functions, and effect of lesions.	10		
3.	**Reflex:** definition, classification, properties. Reflex arc:definition, component stretch reflex, knee jerk, planter response and Withdrawal reflex-with reciprocal innervations & crossed extensor-pathway . **Muscle spindle, Golgi tendon organ:** definition, physiological anatomy and functions**. Muscle tone** : definition , function and maintenance.	10		
4.	**Descending tracts/ motor pathways-** name Pyramidal tract: origin, course, termination, function, effect of lesion. Extrapyramidal tract: name, functions. Upper motor neuron and lower motor neuron : definition, effect of lesion. **Spinal cord** : effect of hemisection.	10		
5.	**Cerebellum:** functional division, neuronal circuit, functions, error control mechanism of motor activity & cerebellar disorder,	10		
6.	**Basal ganglia:** functional components, functions & effects of lesions.	10		

	Thalamus, Reticular formation, Limbic system: functional components and functions. **CSF:** circulation & functions. **Blood brain barrier:** function.			
8.	**Hypothalamus:** name of the nucleus, functions **Body Temperature** Normal body temperature, site of measurement, sources of heat gain, channels of heat loss, regulation of body temperature in hot and cold environment.	10		
9.	**Autonomic Nervous system:** physiological anatomy of sympathetic and parasympathetic system, functions. Alarm or stress response	10		
10.	**Vision: p**hysiological anatomy of eye, image formation in the eyes, visual receptors, visual pathway, common refractive errors, accommodation reaction, light reflex, dark and light adaptation. Field of vision, color vision, visual acuity	10		
11.	**Hearing:** auditory apparatus, receptor, Mechanism of hearing, mechanism of sound transmission and auditory pathway.	10		
12.	**Smell:** receptor and pathway**.** **Taste:** receptors, modalities of taste sensation and pathway.	10		

Signature of Batch Teacher:

Signature of Head of the Department:

Continuous Assessment Card

Department of Physiology---------- **Medical college**----------

Students name---------- **Roll no.**----------

Session ---------- **Year** ---------- **Batch** ----------

Date of starting ---------- **Date of ending** ----------

Card 8: Physiology Practical

(I hear and I forget, I see and I remember, I do and I understand)

SL NO	**Name of experiment**	**Full Marks**	**Marks obtained**
1	laboratory equipment. laboratory animals, blood sample, collection (venous &capillary) of blood.	10	
2	Preparation & staining of blood film & differential count of WBC with interpretation and analysis of result	10	
3	Determination of total count of WBC with interpretation and analysis of result	10	
4	Determination of total count of RBC with interpretation and analysis of result	10	
5	Estimation of haemoglobin with interpretation and analysis of result	10	
6	Determination of packed cell volume (PCV), Calculation of MCV, MCH & MCHC with interpretation and analysis of result	10	
7	Estimation of ESR by Westergren method with interpretation and analysis of result	10	
8	Determination of bleeding time, clotting time with interpretation and analysis of result	10	
9	Study of morphology and osmotic behavior of RBC with interpretation and analysis of result	10	
10	Determination of ABO & Rh blood groups with interpretation and analysis of result	10	
11	Auscultation of 1^{st}& 2^{nd} heart sounds	10	
12	Clinical examination of radial pulse.	10	

13	Measurement of normal blood pressure & effects of exercise on blood pressure.	10	
14	Recording & analysis of 12 leads normal ECG	10	
15	Auscultation of breath sounds	10	
16	Spirometric measurement of lung function test. Determination of FVC, FEV_1,FEV_1/FVC %, PEFR, MVV with analysis of result.	10	
17	Study on the tracing of respiratory movements & effects of breath holding, hyperventilation, speech, deglutition (physiological apnoea) .	10	
18	Auscultation of intestinal sound.	10	
19	Elicitation of knee jerk, planter response	10	
20	Recording of oral & axillary temperature & effects of exercise on it	10	
21	Mapping of visual field by perimeter	10	
22	Observation of light reflexes and analysis of result	10	
23	Determination of color vision	10	
24	Determination of visual acuity by Snellen's chart.	10	
25	Determination of hearing tests: Rinne and Weber test with interpretation and analysis of result	10	
26.	Determination of specific gravity of urine	10	

Signature of Batch Teacher:

Signature of Head of the Department:

6. Provisional Tabulation Sheet

DEPARTMENT OF PHYSIOLOGY

First Professional MBBS Examination of , 20

Roll No.	Oral (SOE)			Practical				
	Board I	Board II	Total	OSPE	Traditional	Note book	Assignment on Integrated Teaching	Total
	50	**50**	**100**	**40**	**40**	**10**	**10**	**100**

Signature of the examiners