

**Jawaharlal Institute of Postgraduate Medical
Education & Research
(JIPMER)
Puducherry**



BSc Anaesthesia Technology

CURRICULUM

2021

This curriculum was approved at the 16th meeting of the Standing Academic Committee held on September 21, 2021 and will be applicable for students joining BSc (Allied Health Sciences) – Anaesthesia Technology from the academic year 2021-22. The curriculum document was prepared based on the model curricula for allied health sciences courses issued by the Ministry of Health and Family Welfare, Government of India.

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About JIPMER

Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry (JIPMER) under Government of India since the year 1956, is one of the leading Medical Institutions of India. Spread over a sprawling 195-acre campus in an urban locale of Puducherry (formerly Pondicherry), JIPMER is 170 kms by road from Chennai.

JIPMER has been declared as an “Institution of National Importance” by an Act of Parliament, JIPMER, Puducherry, Act, 2008. A copy of the Act was Gazette notified on 14-7-2008 to enforce this Act. Prior to this, the Institute was functioning under the administrative control of Directorate General of Health Services, Ministry of Health and Family Welfare, New Delhi. The Institution is now empowered to award Medical Degrees under the clauses 23 & 24 of the said Act. Such Degrees shall be deemed to be included in the schedules to the respective Acts governing Medical Council of India/National Medical Commission, Indian Nursing Council, and Dental Council of India, entitling the holders to the same privileges as those attached to the equivalent awards from the recognized Universities of India.

JIPMER imparts Undergraduate (UG), Postgraduate (PG) and Super Specialty Medical Training through a large hospital complex (JIPMER Hospital) and a Nursing College. Some of the courses offered are MBBS, BSc, MSc, MD, MS, DM, and MCh courses. Full-time Ph.D. programs are available in several disciplines.

About the Department of Anaesthesiology and critical care

The Department of Anaesthesiology and critical care is one of the first departments started in JIPMER in 1954. Currently the department conducts various undergraduate, postgraduate and postdoctoral academic programs including MD, DM (cardiac anaesthesiology), DM (neuroanaesthesiology), DM (critical care) and BSc (Anesthesia technology).

Clinical services are provided in anaesthesia, procedural sedation, critical care and chronic pain management. Anaesthesia services for elective surgical procedures performed in Obstetrics & Gynaecology, General surgery, Orthopaedics, ENT, Ophthalmology, Maxillofacial surgery, Pediatric surgery, Urology, Neurosurgery, Plastic surgery, surgical oncology, Cardiothoracic and vascular surgery and Surgical gastroenterology is provided in 20 operating rooms in Main Hospital block, PMRC block, Superspeciality (SSB) block and Women and Children Hospital (WCH) block.

COURSE DETAILS

Nomenclature: BSc (Allied Health Sciences) – Anaesthesia Technology

Introduction:

Anaesthesiology is a branch of medicine involved in the perioperative care of patients, including the procedure of providing appropriate anaesthesia during the surgical procedure. The field has evolved rapidly due to technological advances. As a result, there is a need for technological assistance during various procedures. Anaesthesia technology encompasses procedures and techniques performing in the operation room as well as in critical care facilities overseen by anaesthesiologists.

Objectives of the course:

The aim of the course is to impart appropriate knowledge and skills to work closely with anaesthesiologists in the operation theatre and in related activities of the department. At the end of the course, a B.Sc. (AHS) Anaesthesia Technology graduate will be able to:

1. help the anaesthesiologist in administering anaesthesia, assist in various procedures
2. and also help in continuous monitoring of patients during surgery.
3. assist anaesthesiologists in developing and plummeting patient anaesthesia care plans, including pre-operative, surgical theatre, recovery room, and post-operative intensive care procedures.
4. do patient data collection, catheter insertion, airway management, assisting the administration and monitoring of regional and peripheral nerve blockades, support therapy, adjusting anaesthetic levels during surgery, inter-operative monitoring, postoperative procedures, pain clinics and patient education, and administrative tasks.
5. manage medical gases and pipeline system
6. assist in Intensive care unit

First phase: one year

In addition to the subjects of foundation course, Anatomy, and Physiology, students will learn the basic concepts in areas such as Biochemistry, Biomedical sciences, and basics of anaesthesia technology.

Second phase: one year

In the Second phase, the students will learn the principles of anaesthesia and basic anaesthetic techniques. They will also learn about various medical comorbidities that need to be considered when anaesthesia is planned.

Third phase: one year

In the Third phase, the students will learn the basics of surgery, sterilisation followed in operating rooms, safety and crisis management. They will learn about anaesthesia techniques employed in various speciality surgeries. In addition, they will be trained in basic critical care relevant to anaesthesia.

Internship: one year

Internship of one year is compulsory. The interns will be given hands-on training in various anaesthetic procedures in various operating rooms and involving multiple specialities. They will also be trained in critical care facility relevant to anaesthesia.

Expectations from the future graduate

The Course prepares an anaesthesia technologist to work as a competent, reliable member of the health care team under the guidance and supervision of doctors in the delivery of patient care, training also focuses on the knowledge and skills of monitoring infection control policy and procedures in anaesthesia.

Employment opportunities can be found in hospitals in both private and public sectors as well as in independent trauma centres.

The graduate is encouraged to pursue further qualification to attain senior position in the professional field, also to keep abreast with the advance and new technology, the professional should opt for continuous professional education credits offered by national and international institutes.

Scope of course:

The Anaesthesia Technologists are responsible for direct and indirect patient care, equipment set-up and operative procedures. They are trained to assist the anesthesiologists during surgical procedures and assume responsibility for completion of other functions as assigned. Once aspirants have successfully finished the BSc course in Anesthesia technology, they can work as Anesthesia technologists in the field of medicine. These candidates are needed mostly in hospitals. So, many career opportunities are available for them in the private and public sector firms. Business as well as research is another field which Anesthesia technologists can choose. The remuneration of these technologists will be quite reasonable as well. With sufficient experience in the field concerned, aspirants can expect good salaries. Graduates of this field can also get jobs abroad.

Job profile:

A qualified Anaesthesia Technologist typically performs the following roles (but not limited to) in an operating room and related areas:

1. Setup, check, and maintain anaesthesia machine, monitors life support equipment like airway equipment, ventilator, emergency equipment, defibrillator, anaesthetic and resuscitation drugs.
2. Orders, maintains, and keep records of all anaesthesia equipment and drug.
3. Assist Anaesthetist in patient procedures like setting up of invasive lines, airway management, setting up of monitors and administer anaesthesia to patient
4. Assists during emergency situations in providing basic and advanced life support, critical events.
5. Management in Intensive Care unit and emergency department of equipment like ventilators, monitors, infusion pumps, defibrillators etc.

6. Assist disaster team in disaster situations and national emergencies on field and safe transport in ambulance.
7. Assist anaesthesia and surgical team in all kinds of surgical disciplines.
8. Assist anaesthetist during anaesthesia procedures outside operation theatres like CT and MRI suits, Cardiac catheterization laboratory, pain relief procedures etc.

Eligibility for the course:

- The Applicant should be an **Indian National**.
- He/she should have completed **17 years** at the time of application cut-off date.
- There is **no upper age limit**.

The applicants should have passed the qualifying examinations in the manner mentioned below:

- The Higher / Senior Secondary Examination or the Indian School Certificate Examination which is equivalent to 10+2 Higher/Senior Secondary Examination after a period of 12 years study, the last two years of such study comprising Physics, Chemistry, Biology/ Botany & Zoology (which shall include practical tests in these subjects) and with English as a subject.
- The applicant must have passed in the subjects of Physics, Chemistry, Biology/Botany & Zoology and English individually and must have obtained a minimum of 50% marks taken together in Physics, Chemistry, Biology/Botany & Zoology at the qualifying examination
- Candidates belonging to the Scheduled Castes/Scheduled Tribe or Other Backward Classes must have obtained a minimum of 40% marks in the subjects of Physics, Chemistry, Biology / Botany & Zoology taken together in the qualifying examination.
- For PwD candidates in general and EWS categories, the minimum marks in Physics, Chemistry, Biology/ Botany & Zoology taken together in the qualifying examination is 45%.

Candidates intake per year:

Five candidates will be admitted to the course every year. There is no provision for sponsored / nominated candidates.

Duration of the course

4 years (48 months) duration including 3 years of classes and one year of compulsory internship.

Medium of instruction:

English

Vacation:

Students will be eligible for 4 weeks of vacation in summer and 2 weeks in winter.

Subject details:

Phase	Paper	Title of the paper
I	I	Foundation course (T & P)
	II	Anatomy and Physiology (T & P)
	III	Pathology and Microbiology (T)
	IV	Biomedical Sciences & Introduction to Anaesthesia Technology (T & P)
II	I	Principles of Anaesthesia (T & P)
	II	Basic Anaesthetic techniques (T & P)
	III	Medical comorbidities related to Anaesthesia (T & P)
III	I	Basics of surgery, sterilization, safety, and crisis management (T & P)
	II	Anaesthesia technology for speciality surgeries (T & P)
	III	Basic Critical Care relevant to anaesthesia technology (T & P)
IV	Internship period	

T- Theory, P- Practical

Teaching hours:

Phase	Subject	Theory	Practical	Others
I	Foundation course	80	40	
	Anatomy	60	180	
	Physiology	60	180	
	Pathology	40		
	Microbiology	40		
	Biomedical Sciences & Introduction to Anaesthesia Technology	60	280	
	Self-study/Library			60
Total				1080
II	Principles of Anaesthesia	60	280	
	Basic Anaesthetic techniques	60	280	
	Medical comorbidities related to Anaesthesia	60	280	
	Self-study/Library			60
Total				1080
III	Basics of surgery, sterilization, safety, and crisis management	60	280	
	Anaesthesia technology for speciality surgeries	60	280	
	Basic Critical Care relevant to anaesthesia technology	60	280	
	Self-study/Library			60
Total				1080
IV	Internship			

SYLLABUS

Phase I

Paper I: Foundation course

Theory:

Introduction to National Healthcare System

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world. Topics to be covered under the subject are as follows:

1. Introduction to healthcare delivery system
 - a. Healthcare delivery system in India at primary, secondary and tertiary care
 - b. Community participation in healthcare delivery system
 - c. Health system in developed countries.
 - d. Private Sector
 - e. National Health Mission
 - f. National Health Policy
 - g. Issues in Health Care Delivery System in India
2. National Health Programme- Background objectives, action plan, targets, operations, achievements, and constraints in various National Health Programme.
3. Introduction to AYUSH system of medicine
 - a. Introduction to Ayurveda.
 - b. Yoga and Naturopathy
 - c. Unani
 - d. Siddha
 - e. Homeopathy
 - f. Need for integration of various system of medicine
4. Health scenario of India- past, present, and future
5. Demography & Vital Statistics-
 - a. Demography – its concept
 - b. Vital events of life & its impact on demography
 - c. Significance and recording of vital statistics
 - d. Census & its impact on health policy
6. Epidemiology
 - a. Principles of Epidemiology
 - b. Natural History of disease
 - c. Methods of Epidemiological studies

d. Epidemiology of communicable & non-communicable diseases, disease transmission, host defence immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Medical terminologies and record keeping

This course introduces the elements of medical terminology. Emphasis is placed on building familiarity with medical words through knowledge of roots, prefixes, and suffixes. Topics include origin, word building, abbreviations and symbols, terminology related to the human anatomy, reading medical orders and reports, and terminology specific to the student's field of study. Spelling is critical and will be counted when grading tests.²⁵ Topics to be covered under the subject are as follows:

1. Derivation of medical terms.
2. Define word roots, prefixes, and suffixes.
3. Conventions for combined morphemes and the formation of plurals.
4. Basic medical terms.
5. Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
6. Interpret basic medical abbreviations/symbols.
7. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
8. Interpret medical orders/reports.
9. Data entry and management on electronic health record system.

Basic computers and information science

The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation. Topics to be covered under the subject are as follows:

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).
3. Processor and memory: The Central Processing Unit (CPU), main memory.
4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing, and maximizing, etc.).
6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
9. Introduction of Operating System: introduction, operating system concepts, types of operating system.
10. Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
11. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
12. Application of Computers in clinical settings.

Medical law and ethics

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the modern society's legal framework, increasing awareness of human rights and changing moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.²⁶

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analysing, and attempting to resolve the ethical problems that arise in practice".²⁶ Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum. Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia

7. Organ transplantation
8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

Communication and soft skills

Major topics to be covered under Communication course –

1. Basic Language Skills: Grammar and Usage.
2. Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.
3. Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.
4. Basic concepts & principles of good communication
5. Special characteristics of health communication
6. Types & process of communication
7. Barriers of communication & how to overcome

Introduction to Quality and patient safety

1. Quality assurance and management - The objective of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system.
 - a. Concepts of Quality of Care
 - b. Quality Improvement Approaches
 - c. Standards and Norms
 - d. Quality Improvement Tools
 - e. Introduction to NABH guidelines
2. Basics of emergency care and life support skills - Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED). Initial recognition and response to heart attack and stroke are also

considered part of BLS. The student is also expected to learn about basic emergency care including first aid and triage. Topics to be covered under the subject are as follows:

- a. Vital signs and primary assessment
- b. Basic emergency care – first aid and triage
- c. Ventilations including use of bag-valve-masks (BVMs)
- d. Choking, rescue breathing methods
- e. One- and Two-rescuer CPR
- f. Using an AED (Automated external defibrillator).
- g. Managing an emergency including moving a patient

At the end of this topic, focus should be to teach the students to perform the manoeuvres in simulation lab and to test their skills with focus on airways management and chest compressions. At the end of the foundation course, each student should be able to perform and execute/operate on the above-mentioned modalities.

3. Bio medical waste management and environment safety- The aim of this section will be to help prevent harm to workers, property, the environment, and the general public. Topics to be covered under the subject are as follows:

- a. Definition of Biomedical Waste
- b. Waste minimization
- c. BMW – Segregation, collection, transportation, treatment, and disposal (including colour coding)
- d. Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
- e. BMW Management & methods of disinfection
- f. Modern technology for handling BMW
- g. Use of Personal protective equipment (PPE)
- h. Monitoring & controlling of cross infection (Protective devices)

4. Infection prevention and control - The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes. Concepts taught should include –

- a. Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)],
- b. Prevention & control of common healthcare associated infections,
- c. Components of an effective infection control program, and
- d. Guidelines (NABH and JCI) for Hospital Infection Control

5. Antibiotic Resistance-

- a. History of Antibiotics
- b. How Resistance Happens and Spreads
- c. Types of resistance- Intrinsic, Acquired, Passive
- d. Trends in Drug Resistance
- e. Actions to Fight Resistance
- f. Bacterial persistence
- g. Antibiotic sensitivity
- h. Consequences of antibiotic resistance
- i. Antimicrobial Stewardship- Barriers and opportunities, Tools and models in hospitals

6. Disaster preparedness and management- The objective of this section will be to provide knowledge on the principles of on-site disaster management. Concepts to be taught should include-

- a. Fundamentals of emergency management,
- b. Psychological impact management,
- c. Resource management,
- d. Preparedness and risk reduction,
- e. Key response functions (including public health, logistics and governance, recovery, rehabilitation, and reconstruction), information management, incident command and institutional mechanisms.

Professionalism and values

The module on professionalism will deliver the concept of what it means to be a professional and how a specialized profession is different from a usual vocation. It also explains how relevant professionalism in terms of healthcare system is and how it affects the overall patient environment.

1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
2. Personal values- ethical or moral values
3. Attitude and behaviour- professional behaviour, treating people equally
4. Code of conduct, professional accountability and responsibility, misconduct
5. Differences between professions and importance of team efforts
6. Cultural issues in the healthcare environment

Research Methodology and Biostatistics

The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Basic Concepts of Biostatistics
6. Types of Data
7. Research tools and Data collection methods
8. Sampling methods
9. Developing a research proposal

Principles of Management

The course is intended to provide a knowledge about the basic principles of Management.

1. Introduction to management
2. Strategic Management
3. Foundations of Planning
4. Planning Tools and Techniques
5. Decision Making, conflict and stress management
6. Managing Change and Innovation
7. Understanding Groups and Teams
8. Leadership
9. Time Management
10. Cost and efficiency

Community orientation and clinical visit

The objective of this section of the foundation course is to sensitize potential learners with essential knowledge; this will lay a sound foundation for their learning across the undergraduate program and across their career. Innovative teaching methods should be used to ensure the attention of a student and make them more receptive such as group activities, interactive fora, role plays, and clinical bed-side demonstrations.

1. The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries, and clinics.

2. The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front-line health workers.
3. Clinical visit to their respective professional department within the hospital.

Practical:

Fundamentals of computers

1. Learning to use MS office: MS word, MS PowerPoint, MS Excel
2. To install different software.
3. Data entry efficiency

Paper II: Anatomy and Physiology

Gross anatomy and Histology

Theory:

General Anatomy:

Introduction – Anatomical terms, position, movements; epithelium – classification, structure & examples; Tissues – classification and structure; skin – structure, thick and thin skin; cartilage – types, structure, hyaline, elastic, and white fibrocartilage; bones – classification, structure, growth; muscles - classification & structure; glands - classification & structure.

Musculoskeletal system:

Axial and appendicular skeleton – muscle groups and regions muscles with action.

Cardiovascular and lymphatic system:

Structure of pericardium, heart & major blood vessels – arteries, veins, and lymphatic system – classification and structure of lymphoid organs – thymus, spleen, lymph node, tonsil, and major lymphatic vessels.

Respiratory system:

Parts of respiratory system, structure of external nose, paranasal air sinuses, nasal cavity, nasopharynx, larynx, trachea, pleura, lungs & diaphragm.

Gastrointestinal system:

Parts of gastrointestinal system, salivary glands, oral cavity, oropharynx and laryngopharynx, esophagus, stomach, small intestine, large intestine, liver, gallbladder, extrahepatic biliary apparatus, and pancreas.

Excretory system:

Parts of excretory system – structure of kidney, ureter, urinary bladder & urethra.

Male and female reproductive systems:

Structure & parts of male reproductive system, external genitalia, testis, epididymis, vasdeferens, seminal vesicle and prostate.

Structure & parts of female reproductive system, uterus, ovary, fallopian tubes, and mammary gland

Endocrine system:

Location & structure of thyroid, parathyroid, pituitary, adrenal glands.

Special senses:

Structure of eyeball, external, middle & internal ear, and papillae of tongue.

Nervous system:

Neuron, neuroglia, classification, autonomic nervous system, meninges, parts of brain, cerebrum, cerebellum, basal nuclei, limbic system, thalamus, hypothalamus, spinal cord, circulation of cerebrospinal fluid.

Histology:**General histology:**

Microscopy – Types of microscopes, parts of microscope, cleaning, and maintenance of microscope.

Microscopic features of

1. Cartilages
 - 1.1 Hyaline,
 - 1.2 Elastic
 - 1.3 White fibro cartilages
2. Bones
 - 2.1 Longitudinal section of compact bone
 - 2.2 Cross section of compact bone
3. Muscles
 - 3.1 Skeletal muscle
 - 3.2 Cardiac muscle
4. Glands
 - 4.1 Serous gland
 - 4.2 Mucous gland
 - 4.3 Mixed gland
5. Blood vessels
 - 5.1 Medium sized artery
 - 5.2 Large sized artery
 - 5.3 Medium sized vein
 - 5.4 Large sized vein
6. Nervous tissue
 - 6.1 Peripheral nerve H & E stain
 - 6.2 Peripheral nerve Osmic acid stain
 - 6.3 Dorsal root (spinal) ganglia
 - 6.4 Autonomic ganglia
7. Lymphoid organs
 - 7.1 Thymus
 - 7.2 Lymph node
 - 7.3 Spleen
 - 7.4 Tonsil
8. Skin
 - 8.1 Thick skin
 - 8.2 Thin skin

Practical: Anatomy (Gross anatomy and Histology)

1. Demonstration of bones
2. Demonstration of various parts of body
3. Demonstration of parts of digestive system
4. Demonstration of parts of respiratory system
5. Demonstration of parts of reproductive system
6. Demonstration of parts of excretory system
7. Demonstration of various parts of circulatory system
8. Demonstration of various parts of nervous system
9. General histology slides

Textbooks Recommended (Latest edition):**General anatomy:**

1. Handbook of General Anatomy – B.D. Chaurasia - CBS Publishers

Systemic Anatomy:

1. Textbook of Anatomy – Vishram Singh – Elsevier
2. B.D. Chaurasia's Human Anatomy – CBS Publishers
3. Manipal Manual of Anatomy for Allied Health Science Courses

Histology:

1. Textbook of Human Histology: With Color Atlas 3D Illustrations – Dr. Yogesh Sontakke
2. Textbook of Histology - A Practical guide – Dr. J. P Gunasegaran
3. Di Fiore's Atlas of Histology – Eroschenko – Lippincott Williams & Wilkins

Reference textbook:

Gray's Anatomy: The Anatomical Basis of Clinical Practice – Susan Standring – Elsevier

Physiology**Theory:****1. General Physiology**

- a. Principle of homeostasis
- b. Cell membrane, cell organelles, intercellular junctions
- c. Transport across cell membrane
- d. Body fluids: Classification of body fluid compartments, ionic composition, measurement
- e. Resting membrane potential

2. Blood

- a. Composition of blood

- b. Plasma proteins: classification and functions
- c. RBC: development, morphology, counts, functions and dysfunctions
- d. Hemoglobin: types, structure, synthesis, function, degradation, anemia
- e. WBC: development, classification, morphology, counts, functions and dysfunctions
- f. Immunity: definition, classification, Innate, Cellular and Humoral Immunity
- g. Platelets: morphology, counts, development, functions and dysfunctions
- h. Blood coagulation: clotting factors, mechanism, dysfunctions
- i. Anticoagulants
- j. Blood grouping: classification, cross matching, blood transfusion, Rh factor and incompatibility

3. Nerve

- a. Structure, function, classification of neurons
- b. Neuronal action potential: ionic basis and properties
- c. Conduction of nerve impulses
- d. Nerve Injuries
- e. Neuromuscular junction: structure, mechanism of transmission & applied aspects

4. Muscle

- a. Structure of skeletal muscle & sarcotubular system
- b. Mechanism of contraction and relaxation of skeletal muscle
- c. Isotonic and isometric contraction
- d. Properties of skeletal muscle
- e. Smooth muscle: structure, properties, and mechanism of contraction
- f. Differences between skeletal, smooth, and cardiac muscles

5. Autonomic nervous system

- a. Divisions and functions

6. Gastrointestinal (GI) system

- a. Functional anatomy of GIT
- b. Gastrointestinal hormones
- c. Principles & Functions of GI secretions, applied aspects
- d. Movements of GIT, applied aspects

7. Endocrine system

Hormones, actions, and dysfunctions of various endocrine glands:

- a. Hypothalamus
- b. Pituitary
- c. Thyroid
- d. Parathyroid and hormones involved in calcium homeostasis
- e. Adrenal gland
- f. Endocrine pancreas

8. Reproductive System

- a. Male and female gametogenesis
- b. Structure and function of male reproductive system
- c. Structure of female reproductive system, menstrual cycle, pregnancy, parturition,

lactation

d. Contraceptives

9. Kidney

- a. Structure & function of kidney, structure of nephron, composition of urine
- b. Glomerular filtration rate: definition, values, regulation and measurement
- c. Mechanism of urine formation: tubular functions, concentration of urine, acidification of urine
- d. Micturition reflex
- e. Diuretics
- f. Dialysis

10. Cardiovascular system

- a. Functional anatomy of heart
- b. Circulatory system: arterial, venous, capillary circulation
- c. Structure and properties of cardiac muscle
- d. Electrophysiology of heart and conduction of impulse
- e. ECG: waveforms and physiological basis
- f. Cardiac cycle, heart sounds, Jugular venous pulse
- g. Stroke volume, heart rate, cardiac output – definition, normal values and their regulation
- h. Blood pressure and regulation
- i. Coronary circulation
- j. Lymphatic circulation
- k. Applied aspects: shock, hypertension, hypotension, tachycardia, bradycardia, heart failure

11. Respiratory system

- a. Functional anatomy of respiratory system
- b. Mechanics of breathing, lung volumes and capacities, compliance, surfactant
- c. Alveolar ventilation, dead space, pulmonary circulation, ventilation-perfusion ratio
- d. Diffusion and gas exchange
- e. Transport of oxygen and carbon dioxide
- f. Brief account of respiratory regulation
- g. Acclimatization, definition & types of hypoxia, oxygen therapy, cyanosis, asphyxia.
- h. Methods of artificial respiration

12. Central nervous system

- a. Parts and functions of brain and spinal cord
- b. Sensory system: receptors and ascending pathways
- c. Motor system: motor neurons, motor units, muscle spindle, stretch reflex, and descending tracts with emphasis on corticospinal tract
- d. Cerebellum- functional anatomy, functions, and dysfunctions
- e. Basal ganglia- functional anatomy, functions, and dysfunctions
- f. Functions of hypothalamus

- g. Functions of Thalamus
- h. Types of sleep and EEG
- i. Cerebrospinal fluid
- j. Higher functions: types of memory, centers of speech, types of aphasia in brief, Cerebral cortex-lobes and functions
- k. Blood-brain barrier

13. Special senses

- a. Vision: Components of visual apparatus, visual acuity, color vision, accommodation, errors of refraction, visual pathway, pupillary reflexes
- b. Hearing: External, middle ear, inner ear and their functions, auditory pathway, hearing tests.
- c. Taste – receptors and pathway
- d. smell: receptors and pathway

14. Integrative Physiology

- a. Structure and functions of skin
- b. Regulation of temperature

Practical: Physiology

1. Hematology

- a. Methods of collection of blood
- b. Microscopy
- c. Haemocytometry
- d. Total RBC count
- e. Estimation of haemoglobin
- f. Calculation of blood indices
- g. Demonstration of osmotic fragility of red blood cells
- h. Determination of ESR
- i. Total leucocyte count
- j. Absolute eosinophil count
- k. Peripheral blood smear
- l. Differential leukocyte count
- m. Arneeth count
- n. Determination of blood group
- o. Bleeding time, Clotting time
- p. Demonstration of reticulocyte count
- q. Demonstration of platelet count
- r. Demonstration of PCV

2. Clinical

- a. General physical examination
- b. Clinical examination of Radial pulse
- c. Determination of blood pressure

- d. Recording of Electrocardiogram
- e. Examination of cardiovascular system
- f. Examination of respiratory system
- g. Demonstration of spirometry
- h. Determination of vital capacity and effect of posture of vital capacity
- i. Examination of sensory system
- j. Examination of motor system
- k. Visual acuity
- l. Color vision
- m. Pupillary reflexes
- n. Perimetry
- o. Tests of hearing
- p. Mosso's ergography

Textbooks recommended: (Latest edition)

- 1. Textbook of Medical Physiology by G.K. Pal (Theory)
- 2. Textbook of Practical Physiology by G.K. Pal & Pravati Pal (Practical)

Teaching learning methodology:

The course content in Physiology will be covered by:

- 1. Interactive Lectures
- 2. Group Discussions
- 3. Practical classes & demonstrations
- 4. Seminars
- 5. Assignments

Paper III: Pathology and Microbiology

Pathology

The Pathology syllabus introduces the principles of **Pathology** with emphasis on applied aspects of Pathology particularly in the following areas:

1. Collection and dispatch of specimens for routine pathological investigations
2. Common routine pathology tests
3. General concepts of Pathology
4. Laboratory diagnosis of common pathological conditions
5. Systemic Pathology
6. Applied Surgical Pathology, cytopathology, hematopathology, renal pathology and neuropathology

Theory:

1. Adaptations, cell injury and repair

- a. Hyperplasia,
- b. hypertrophy,
- c. atrophy,
- d. metaplasia,
- e. Necrosis and
- f. Apoptosis

2. Acute and chronic inflammation

- a. Cardinal signs of inflammation
- b. Outcomes of acute inflammation
- c. Chronic inflammation
- d. Granulomatous inflammation
- e. Acute phase proteins

3. Tissue repair, regeneration, and hemodynamic disorders

- a. Cutaneous wound healing
- b. Pathological aspects of repair
- c. Hyperaemia and congestion
- d. Thrombosis and Virchow triad
- e. Embolism, infarction, and shock

4. Disorders of immune system

- a. Types of hypersensitivity reactions
- b. Autoimmune diseases

5. Neoplasia

- a. Definition of neoplasia.
- b. Differences between benign and malignant tumours

- c. Metastasis
- d. Carcinogenesis – causes

6. Applied general pathology related to transfusion medicine

- a. ABO blood group & Rh system (terminologies)
- b. Principles of blood grouping and cross matching
- c. Shelf life of stored blood
- d. Anticoagulants used for storing blood and temperature for storage

7. RBC, WBC, and bleeding disorders

- a. Anaemia – definition and classification
- b. Iron deficiency anaemia and haemolytic anaemia
- c. Leukocytosis and leukaemia
- d. Causes of splenomegaly
- e. Thrombocytopenia and coagulation disorders
- f. Phlebotomy, haemoglobin estimation, peripheral smear examination, bleeding time, PT and APTT

8. Disorders of GI tract, liver, biliary tract, and pancreas

- a. Causes of peptic ulcer, carcinoma stomach, intestinal obstruction, acute appendicitis, and colonic carcinoma
- b. Jaundice – classification based on pathophysiology
- c. Cirrhosis – definition and causes
- d. Hepatitis – types and mode of transmission
- e. Portal hypertension and hepatic failure

9. Blood vessels, heart, and lung diseases

- a. Risk factors for atherosclerosis and their classification
- b. Hypertension – definition and causes
- c. Varicose veins, thrombophlebitis and phlebothrombosis
- d. Congenital heart disease and heart failure
- e. Myocardial infarction and cor-pulmonale
- f. Rheumatic heart disease
- g. Chronic obstructive airway disease
- h. Asthma, pneumonia, and lung carcinoma

10. The kidney and lower urinary tract, male and female genital tract

- a. Acute and chronic renal failure
- b. Nephrotic and nephritis syndrome
- c. Acute tubular necrosis and urolithiasis
- d. Carcinoma penis, testicular tumours, and prostatic hyperplasia
- e. Endometriosis, adenomyosis and leiomyoma

11. Endocrine and nervous system

- a. Diagnostic criteria, types, and complications of diabetic mellitus

- b. Intracerebral, subarachnoid, and subdural haemorrhage
- c. Meningitis and encephalitis
- d. Epilepsy and CNS tumours

12. Applied Surgical Pathology & Cytopathology, renal pathology, and neuropathology

- a. Histopathology techniques
- b. Fine needle aspiration cytology and imprint cytology
- c. Basic terminologies of surgical specimens
- d. Urine analysis and renal biopsy
- e. CSF cytology, nerve and muscle biopsy, squash cytology

Textbooks recommended (latest edition):

1. Illustrated Pathology – McFarlen
2. Essentials of Rubin's Pathology
3. Basic Pathology by Robbins
4. General and systemic Pathology – Underwood and Cross

Teaching and Learning methodology

Mostly will be didactic lectures with tutorials.

Microbiology

The Microbiology syllabus introduces the principles of **Microbiology** with emphasis on applied aspects of Microbiology of infectious diseases particularly in the following areas

1. Universal and Standard precaution.
2. Collection and dispatch of specimens for routine microbiological investigations.
3. Common routine serological tests
4. General concept of infection
5. Common Bacteriological, Viral, Fungal, Parasitic infection and Laboratory diagnosis
6. Nosocomial infection
7. Biomedical waste management
8. Vaccine

Theory:

Introduction and Morphology

Introduction of microbiology, Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

Growth and Nutrition

Nutrition, Culture media, Types of medium with example and uses of culture media in diagnostic bacteriology, antimicrobial sensitivity test.

Sterilisation and Disinfection

Principles and use of equipment of sterilization namely Hot Air oven, Autoclave and serum inspissator. Pasteurization, Anti septic and disinfectants.

Immunology

Immunity, Types of Immunity, Vaccines, Types of Vaccine and immunization schedule. Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASLO, ELISA, Rapid tests for HIV and HbsAg

Systematic Bacteriology

Morphology, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (the classification, antigenic structure and pathogenicity are not to be taught) Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacterium tuberculosis, Clostridium spp., Bacillus spp., Shigella spp., Salmonella spp., Escherichia coli, Klebsiella spp., Proteus spp., Vibrio cholera, Pseudomonas spp. & Spirochaetes

Parasitology

Morphology, life cycle, laboratory diagnosis of following parasites E. histolytica, Plasmodium spp., Tapeworms, Intestinal nematodes, Filariasis

Mycology

Morphology, diseases caused, laboratory diagnosis of following fungi. Candida, Cryptococcus, opportunistic fungi

Virology

General properties of viruses, diseases caused, lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis

Hospital Infection

Causative agents, transmission methods, investigation, prevention and control Hospital infection, Universal precaution, Standard precaution

Principles And Practice Biomedical Waste Management

Applied Microbiology

Causative agents, Sample collection and Laboratory diagnosis

Gastrointestinal infections, Nosocomial infections, Urinary tract infections, Respiratory tract infections, Pyogenic Meningitis, Food borne infections, Vector borne infections, Blood borne infections, Aerosol borne infections.

Textbooks recommended (latest editions):

1. CP. Baveja. Textbook of Microbiology for nurses. Arya Publishing Company.
2. RL Ichhpujani, Rajesh Bhatia. Essentials of Medical Microbiology. Jaypee Brothers Medical Pub (p) Ltd.
3. Seema Sood. Microbiology for Nursing Students & Nurses. Elsevier India Pvt.Ltd.
4. Satish Gupte. Short Textbook of Medical Microbiology. Jaypee Brothers Medical Pub (p) Ltd.
5. CK Jayaram Paniker, Ananthanarayan R. Textbook of Microbiology for nurses. Publisher Universities Press (India) Limited.
6. B.S.Nagoba. Clinical Microbiology. Bi Publications Pvt Ltd.
7. Clint E Carter, Burton J Bogitsh, Thomas N Oeltmann. Human Parasitology. Publisher Elsevier India Pvt. Ltd.

Paper IV: Biomedical sciences & Introduction to Anaesthesia Technology**Biomedical sciences****Theory:****Introduction to Mechanics, Matter, heat**

- Physical quantities, Definitions units and explanations-physical quantities (area, volume, velocity, speed, acceleration, momentum, force, work, power, energy), Force and Motion-Scalar and vector quantity.
- Mechanics -Concept of mechanics and applied mechanics.

States of matter:

- Elasticity, definition of stress and strain, Different types of modulus of elasticity, Pressure its units, gauge pressure, absolute pressure, atmospheric pressure, pressure at a point inside liquid column ($p=hdg$)
- Modes of transfer of heat (conduction, convection and radiation with examples).
- Coefficient of thermal conductivity and its unit, absorbing and emissive power of a body.
- Properties of heat radiation.
- Types of wave motion, transverse and longitudinal wave motion, sound, and light waves. Applications of sound waves, coefficient of absorption of sound, Ultrasonic's – production and their applications

Introduction to Electronics & Semi-conductors

- Basic terminology & definitions –Voltage, Current, resistance, capacitance, inductance, conductor, semiconductor, power, energy, rectifier, transformer, impedance.
- Ohm's law. Difference between resistance & impedance.
- Basic network Analysis concepts.
- Types of current-AC & DC; electrical receptacle; difference between AC & DC.
- Fuses & circuit breakers. Theory of semiconductors, semiconductor diode & applications, transistor & characteristics. Special devices like LED, photo diode, diac, triac, FET & MOSFET etc.

Operating Rooms (OR) & Anesthetic Equipment

- List of OR equipment (Anesthesia machine, Monitor, Pulse Oximeter, Suction Apparatus, Gas Plant, Oxygen Concentrator Plant) - Introduction, usage, safety features & application.
- Electrodes, Sensors & Transducers
- Signal acquisition, transduction, active & passive sensors, sensor technology, electrodes for biophysical sensing, medical surface electrodes, and micro electrodes. Strain Gauges, inductive transducers, quartz pressure sensors, capacitive transducers, temperature transducers and piezoelectric transducers.

Electro-optics (Fiber Optics and LASERS)

- Fiber-Optic Technology, History of fiber Optics, Basics, fiber optic & application in medical equipment.
- LASERS - Introduction, basic concepts, types & application.

Practical

- Measurement Device-Usage of Digital Multimeter, measuring voltage, resistance, continuity & temperature.
- Measures the AC voltage in a Power cord Battery- Introduction, Care & maintenance.
- Nickel-cadmium cells and batteries.
- Measures different types of batteries (Nickel-cadmium cells and batteries, Lead-acid batteries, Mercury dry cells, carbon-zinc and alkaline dry cells, Gel cell batteries & lithium cells).
- Battery charging protocols.
- Introduction, Safety features & pre-use check for Electrosurgery Unit (or) Diathermy, Pulse Oximeter, light source, Sphygmomanometer.
- Electromagnetic Interference to Medical Electronic Equipment
- Computers in Biomedical Equipment
- Electrical Safety in the Medical Environment

Introduction to Anaesthesia Technology

Theory

1. Scope of Practice, Roles within the Anaesthesia Care Team

2. History of Anaesthesia

3. The Surgical Experience

- The surgeon's outpatient department, Pre-admission, Pre-op visit, Admission, Pre-op holding.
- The operating room, Post-anaesthesia care unit.
- The Anaesthesia technician's roles, Resource planning, Importance of anaesthesia machine checkout, Multi-tasking, Assisting the anaesthesia provider, Room turnover, Supply management, Importance of equipment management.

4. Introduction to Anaesthetic drugs:

- Classification, Chemical structure, Route of administration, Basic Pharmacodynamics and pharmacokinetics of common Anaesthetic drugs, drug interactions, Drug storage and Safe drug handling in the operation theatre.

5. Medical gas:

- The Gas Laws
- Storage and supply of medical gases
- Anaesthesia equipment inventory maintenance

Recommended books (latest edition):

1. The Anaesthesia Technologist's Manual by Emily S Guimaraes, Matthew Davis, Jeffrey R Kirsch, Glenn Woodworth
2. Handbook of medical instrumentation by R S Kanpur. Tata Mc Graw Hill edition.

Phase II

Paper I: Principles of Anaesthesia

Theory

A. Applied anatomy and physiology related to Anaesthesia

1. Structure and function of the respiratory tract in relation to respiratory system

- Nose - Role in humidification
- Pharynx - Obstruction in airways
- Larynx - Movement of vocal cords, Cord palsies.
- Trachea & Bronchial tree - vessels, nerve supply, respiratory tract, reflexes, bronchospasm
- Alveoli - Layers, Surfactants

2. Respiratory Physiology

- Control of breathing
- Respiratory muscles - diaphragm, intercostals
- Lung volumes - dead space, vital capacity, FRC etc.
- Pleural cavity - intrapleural pressure, pneumothorax.
- Work of breathing - airway resistance, compliance
- Respiratory movements under anaesthesia.
- Tracheal tug - signs, hiccup

3. Pulmonary Gas Exchange and Acid Base Status

- Pulmonary circulation
- Pulmonary oedema,
- Pulmonary hypertension
- Pulmonary function tests
- Transfer of gases - oxygen & Carbon dioxide
- Acid base status, definitions, acidosis types, Alkalosis types, buffers in the body
- Oxygen: properties, storage, supply, hypoxia
- Respiratory failure, type, clinical features, causes.

4. Cardiovascular System

- Anatomy
- Chambers of the heart, major vasculature.
- Coronary supply, innervation.
- Conduction system.
- Cardiac output - determinants, heart rate, preload, after load.
- Coronary blood flow & myocardial oxygen supply
- ECG
- Arrhythmias cardiovascular response to anaesthetic & surgical procedures
- Hypotension - causes, effects, management
- Cardio pulmonary resuscitation.
- Myocardial infarction, hypertension

5. Central Nervous System:

- Topical anatomy of Brain, spinal cord, vertebrae anatomy, CSF circulation, Monro-Kelli principle Intracranial pressure, methods of reduction, neurons, myelination, reflexes, cranial nerves, and function

6. Fluids And Electrolytes

- Body fluid components, movement of water, ions, protein across compartments, osmotic and oncotic pressures, various crystalloids and colloids used in clinical practice and composition
- Indications of fluid therapy, how much fluid to be administered during anaesthesia (Resuscitation, maintenance fluids, how to assess fluid therapy)
- Intravenous (IV) Cannulation., flow rates of various cannula.

7. Blood Transfusion

- Blood grouping, storage, Cross matching.
- Transfusion indications, hazards.
- Blood products – storage, administration.

B. Clinical Pharmacology:**1. Antisialagogues**

- Atropine, Glycopyrrolate

2. Sedatives & Anxiolytics

- Diazepam, Midazolam, Phenergan, Lorazepam, Chlorpromazine, Trichlophos

3. Narcotics

- Morphine, Pethidine, Fentanyl, Pentazozine

4. Antiemetics

- Metoclopramide, Ondansetron, Dexamethasone

5. Antacids

- Na citrate, Gelusil, Mucaine gel.

6. H2 Blockers

- Cimetidine, Ranitidine, Famotidine

7. Induction Agent

- Thiopentone, Diazepam, Midazolam, Ketamine, Propofol, Etomidate.

8. Muscle Relaxants

- Depolarising - Suxamethonium,
- Non depolarising -Pancuronium, Vecuronium, Atracurium, rocuranium

9. Inhalational Gases

- Gases - O₂, N₂O, Air
- Agents - Ether-, Halothane, Isoflurane, Saevoflurane, Desflurane

10. Reversal Agents

- Neostigmine, Glycopyrrolate, Atropine,
- Nalorphine, Naloxone, Flumazenil (Diazepam)

11. Local Anaesthetics

- Xylocaine, Preparation, Local – Bupivacaine - Topical,
- Prilocaine-jelly, Emla - Ointment, Etidocaine. Ropivacaine

12. Emergency Drugs

- Atropine, Adrenaline, Nor-adrenaline, Dopamine, Dobutamine, Vasopressin, Intralipid emulsion

C. Clinical Microbiology

1. Preparation and disinfection of operation theatre and ICU equipment for a patient with universal precautions (Hepatitis B,C, HIV), Scrubbing techniques, Concept of hand hygiene, Bundles of care in ICU to prevent infections
2. Prevention of Health care associated infection (HAI) (Brief SSI, CAUTI, VAP, CLABSI. Precautions and measures to prevent HAI during CV cannulation, urinary catheterization, arterial cannulation, endotracheal intubation. Measures to prevent community acquired pneumonia and hospital acquired pneumonia.
3. Classification of micro-organisms, anti-biotic prescription, how antibiotic resistance happens and spreads, type of resistance (intrinsic, acquired, passive), trends in drug resistance, antibiotic sensitivity, consequences of antibiotic resistance.
4. Sterilization and Disinfection (Definition of terms – High, intermediate, low level disinfection and sterilization, Various methods of disinfection and sterilization,(Dry heat, moist heat, steam methods, gaseous methods) comparative properties of disinfectants)

D. Anaesthesia machine and related Equipment:

1. Theoretical and practical training of anaesthetic machines apparatus.
2. Supply of compressed gases: Types of gases and their chemical and physical properties. Types of medical gas cylinders, their checking and maintenance. Liquid oxygen storage and supply system.
3. Structure of pressure reducing valves. Mechanism of pressure reducing valves, their maintenance and safety checks.
4. Structure and mechanism of flow meters, maintenance and safety checks.
5. Volatile anaesthetic agents: Structure of different types of vaporizers. Principles of various vaporizers, their maintenance and safety precautions.
6. CO₂ absorbers – Types, properties, colours and indicator of exhaustion
7. Types of circuits:
 - a. Open, semi closed and closed circuits
 - b. Non-rebreathing valves
 - c. Mapleson breathing circuits
 - d. T-piece circuit and its modifications
 - e. To and fro system and circle absorber
 - f. Jackson Rees circuit
8. Boyle's anaesthesia apparatus
9. AMBU bag

Paper II: Basic Anaesthetic techniques

Theory

A. General anaesthesia:

- Principles, Preparation and checking of anaesthesia machine, preparation of intubation trays, suction machine
- General preoperative preparation of operating room (temperature, table, electrocautery, position of machine, ventilation of operation theatre, air conditioning, Scavenging)
- Patient identification, Confirmation of NPO, marking, shifting to OT before surgery and out of OT to recovery room after surgery, complete take over and hand over of patient with vital signs recording
- Stages of general anaesthesia, induction, intubation maintenance of depth of anaesthesia, extubation and various Techniques of general anaesthesia
- Monitoring: ECG, Pulse oximetry, Temperature: central and peripheral, end-tidal carbon dioxide, anaesthesia gas monitoring, NIBP, IBP, CVP, anaesthesia depth monitor, neuromuscular transmission monitor
- **Equipment related to anaesthesia:**
 - Intravenous cannula, syringe pumps, central venous catheter, arterial line
 - Endotracheal tubes: Endotracheal tubes - Types, sizes. Cuff system fixing, removing and inflating cuff, checking tube position, complications Various types of endotracheal tubes. Cleaning and sterilization of endotracheal tubes.
 - Difficult airway cart components and preparation (includes all airway devices)
 - Connectors: Various connectors, size and material used.
 - Mask: material, structure and importance of dead space of face mask. Supraglottic devices
 - AMBU Bag
 - Oropharyngeal airway, nasopharyngeal airway
 - Laryngoscopes (Magill, Macintosh, Mc Coy, Video)
 - Fluid warmers
- **Post-anaesthesia care unit:**
 - Transportation of patient, Recovery room – set up and things needed, Post-operative complications & management

B. Regional Anaesthesia:

- Positioning, preparation spinal and epidural trays, sterile precautions, types of spinal and epidural needles, their structure, Block rooms, Indication and contra-indications for regional anaesthesia, LAST and Intra-lipid availability.

C. Procedural Sedation:

- Definition, Various levels of sedation, NPO guidelines, Sedation settings, various sedative agents
- Anaesthesia for Outside OT environment (CT, MRI, ECT, Endoscopy, Colonoscopy, Cath lab, DSA- Neurointervention)

D. Basic life support:

- Emphasis on Circulation, airway, breathing, Drugs used in CPR, Defibrillators.

Recommended books (latest edition):

1. The Anaesthesia Technologist's Manual by Emily S Guimaraes, Matthew Davis, Jeffrey R Kirsch, Glenn Woodworth

Paper III: Medical comorbidities related to Anaesthesia

1. Pain: Pain receptors, Pain pathways, pathophysiology, clinical types, assessment, and management
2. Disorder of haemopoiesis - Anaemias - iron deficiency anaemia,
3. Infectious diseases - Sepsis and septic shock, fever of unknown origin, infective endocarditis, infection of skin, muscle, soft tissue, infection control in hospital, diseases caused by bacteria, viruses, mycobacterium, fungi and protozoa and helminths, common secondary infection in HIV.
4. Diseases of CVS - congenital RHD - Rheumatic fever, CAD, Peripheral vascular diseases. Signs and symptoms of diseases of cardiovascular system
5. Respiratory system - asthma pneumonia, signs, and symptoms of respiratory diseases
6. Kidney & Urinary tract - acute renal failure, Glomerulonephritis, Haemodialysis, Transplant, Urinary tract infection
7. Liver and biliary tract disease - Viral hepatitis, alcoholism, Signs and symptoms of diseases of gastrointestinal system
8. Endocrinology and metabolism - Diabetes mellitus, Hyper - and hypothyroidism
9. CNS disease – EDH, SDH, Brain tumours, Signs and symptoms of diseases of central nervous system.
10. General physical examination: pallor, jaundice, edema, anasarca, clubbing, lymphadenopathy, fever
11. Systemic examination of CVS, RS, CNS, Abdominal system.
12. Injection techniques: intramuscular and intravenous and insertion of i.v. cannula, handling of sterilized syringes and needles
13. Introduction to Medical Ethics specific to Anaesthesia

Recommended books (latest edition):

1. The Anaesthesia Technologist's Manual by Emily S Guimaraes, Matthew Davis, Jeffrey R Kirsch, Glenn Woodworth
2. Medicine for Nurses by SN Chugh

Phase III

Paper I: Basics of surgery, sterilization, safety, and crisis management

A. Basics of Surgery

- History of Surgery, role of the surgeon, importance of teamwork and anticipating the needs of surgeons; stresses that may arise during operative procedure
- Surgical terminology, types of incision and indications for the use of particular incision
- Haemorrhage-signs and symptoms of internal and external; classification and management; Identification of types of tourniquets reasons for use and duration of application, dangers of use;
- Wounds, types, process of healing, treatment and complications; inflammation; wound infections-causes and treatment; incision and drainage of abscesses; importance of personal cleanliness and aseptic techniques;
- Pre-operative and post-operative care of the surgical patient; Emergency procedures; Knowledge of surgical asepsis, skin preparation for invasive procedures

B. CSSD Procedures

- Waste disposal collection of used items from user area, reception protective clothing and disinfection safeguards
- Use of disinfectants sorting and classification of equipment for cleaning purposes, sharps, blunt lighted etc. contaminated high risk baby care - delicate instruments or hot care instruments, cleaning process - use of detergents. Mechanical cleaning apparatus, cleaning instruments, cleaning jars, receivers bowls etc. trays, basins and similar hand ware utensils. Cleaning of catheters and tubings, cleaning glass ware, cleaning syringes and needles.
- Materials used for wrapping and packing assembling pack contents. Types of packs prepared. Inclusion of trays and parts in packs. Method of wrapping and making use of indications to show that a pack of container has been through a sterilization process date stamping.
- General principles of sterilization. Moist heat sterilization. Dry heat sterilization. EO gas sterilization. H₂O₂ gas plasma vapor sterilization.

C. Safety And Crisis Management

1. Hospital Fire Safety:

- Types of fire, Fire triad, electrical fire, role of medical gases in fire, Prevention and extinguishing fire, Laser fire, evacuation plan.
- Electric safety: classification of electric and electronic hospital equipment, Basics of electricity, Role of insulation and electric isolation in prevention of electrocution, Micro and macro shock. Power supply failure.

2. Fall Prevention in the OT:

- Care of circuits and monitoring cables, risk factors for fall
- Patient safety in the OT and during transport: Safe transport, Types of OT trolleys, transfer in and out of OT table, Monitoring during transport, Transport ventilation choice, safety check lists and its utility.
- Safety issues during and after GA and RA administration. Prevention of hospital acquired infections and Hand hygiene

3. Occupation safety:

- Prevention of self-injury.
- Personal protective equipment, Infection prevention, anesthetic drugs, and environment safety.
- Safe disposal of biological and medical waste, Anesthetic waste gas scavenging.

4. Medication safety:

- Safe storage of medication and intravenous fluids in the OT, High risk medications, Medication errors and its prevention.
- Quality improvement: Definition of quality, Equipment maintenance, Incident reporting, briefing, and debriefing. root cause analysis.
- Medical records and records keeping.
- Teamwork and communication.
- OT design and setup.

4. Disaster management:

- Basics of disaster, Preparedness including Resource allocation Common crisis during anesthesia & management
- Difficult airway, cannot intubate and ventilate, Bronchospasm after intubation, Anaphylactic shock, Hypoxia under general anesthesia, Seizure under regional anesthesia, Hypotension after spinal anesthesia
- Total spinal block, Local anesthetic systemic toxicity
- Complications of common patient position in anesthesia, Oxygen supply failure
- Failure of anesthesia machine, failure to awaken after GA, Pulmonary aspiration while attempting intubation
- Hypothermia, hemorrhagic shock, massive blood transfusion, septic shock, Arrhythmia under anesthesia
- Cardiac arrest and basic life support.

Paper II: Anaesthesia technology for speciality surgeries**Theory****1. Neuro Anaesthesia**

- Glasgow coma scale
- Premedication
- Special investigation - CT, Angiography and MRI
- Checklist
- Induction of a patient
- Reinforced Endotracheal tubes
- Positioning in neuro surgery
- Intracranial pressure (ICP)
- Air embolism
- Reversal of the patient
- Transferring to I.C.U. / Ward

2. Obstetric Anaesthesia

- Differences between a pregnant and a normal lady
- Risks for anaesthesia.
- Precautions to be taken
- Check list
- Regional vs general anaesthesia
- Induction / maintenance and recovery
- Resuscitation of the newborn, apgar score
- Reversal and extubation
- Emergencies - manual removal of placenta
 - Antepartum hemorrhage (APH)
 - Postpartum hemorrhage (PPH)
 - Ruptured uterus
 - Ectopic Pregnancy

3. Paediatric Anaesthesia

- Theatre setting
- Check list
- Premedication - modes
- Induction
- Intubation - Securing the EIT
- Reversal & extubation – Problems
- Transferring / ICU management
- Pain management

4. ENT Anaesthesia

- Anaesthesia for adenotonsillectomy
- Anaesthesia for mastoidectomy
- Bronchoscopy and oesophagoscopy

5. Cardiac Anaesthesia :

- NYHA classification
- Arrhythmias
- Angina
- Dyspnoea
- Special investigations
 - Echocardiography
 - Angiography
- Premedication
- Setting up of monitoring system
- Monitoring - invasive and non - invasive
- Getting ready for the case
- Induction of cardiac patient, precautions to be taken
- Cardiopulmonary bypass
- Weaning of CPB
- Transferring the patient to intensive care unit (ICU).
- Care to be taken
- ICU management.
- Chest tube management

6. Anaesthesia outside the operating room

- Cath Lab
- Radiology
- Electroconvulsive therapy (ECT)
- DAY CARE ANAESTHESIA
 - Special features
 - Set up
 - Advantages
 - Disadvantages
 - Complications
 - Future

7. Geriatric Anaesthesia

- Physiological changes
- Diseases of aging
- Nervous system
- Geriatric pharmacodynamics / pharmacokinetics
- Postoperative nervous system dysfunction

8. Anaesthesia for trauma & shock

- Resuscitation
- Preop investigation & assessment
- Circulatory management
- Management of anaesthesia
- Rapid sequence induction
- Other problems

9. Thoracic Anaesthesia

- Pulmonary function tests
- Bed side Vitalograph
- Preoperative preparation
- Premedication check list
- Induction, Intubation
- Double lumen tubes
- Monitoring
- Pain management
- Extubation
- ICU management

10. Postoperative problems

- Nausea & Vomiting
- Sore throat
- Laryngeal granuloma
- Neurological complications.
- Awareness
- Vascular complications
- Trauma to teeth
- Headache
- Backache
- Ocular complications
- Auditory complications

11. Major catastrophes

- Mortality
- Causes of death
- Cerebral damage
- Prevention

Recommended Books(latest edition):

1. The Anaesthesia Technologist's Manual by Emily S Guimaraes, Matthew Davis, Jeffrey R Kirsch, Glenn Woodworth
2. Introduction to the Surgery by Marketa Duskova.

Paper III: Basic Critical Care relevant to anaesthesia technology**Theory****1. ICU ventilator:**

- Basic design, Types, working principles, air oxygen blenders, breathing circuits, ventilator check list, ventilator failure and trouble shooting, setting of ventilators for a new case, care of ventilator, Transport ventilator. ventilator alarm and setting, Basics of scalars and ventilator graphs, Basics of modes of ventilator

2. Flow sensors:

- Classification, working principles, care and trouble shooting

3. Non-invasive ventilation:

- Types of ventilators for NIV, Interfaces and appropriate selection, safe application of interfaces. Care & Trouble shooting.

4. Oxygen delivery devices:

- Classification, working principles, recommended flow range for each device, Passive/bubble humidification, Venturi principle.

5. Humidifiers:

- Classification, working principles, care and trouble shooting of active humidifiers

6. Intermittent pneumatic compression devices:

- Working principles, how to apply, care and trouble shooting

7. ICU beds:

- Patient positioning, Bed movements, Patient fall prevention

8. Transport of sick critically ill patient:

- Preparation, monitoring & support of vital functions during transport, Battery backup, O₂ Cylinder setup.

9. ICU setup:

- Design, fire safety, electrical outlets and medical gas supply and record keeping

10. Ultrasound:

- Types of probes, working principles, knobology, Preparation of probe for examination, cleaning and sterilization of probes, Image optimization, Recording of images and videos & care of the machine.

11. Monitoring and diagnostic procedures in ICU

- Central Venous access.
- ECG monitoring.
- Invasive hemodynamic monitoring

12. General Care Of Patient In I.C.U.

- Eye
- Bladder Skin
- Care of mechanically ventilated patient
- Tracheostomy, humidification
- Vascular lines - arterial, venous line
- Radiography
- Physiotherapy - chest physiotherapy

13. Fluid balance and parenteral nutrition**14. Infectious diseases in ICU**

- Antibiotics in ICU.
- Oxygen therapy
- Mechanical ventilation
- Hand Hygiene
- Care bundles

15. Acid-base disorders:

- Basics, ABG - blood sampling, ABG machine care and trouble shooting.

16. Cardiovascular Failure

- Inotropic support
- Vasodilator drugs.

17. Renal Failure & Liver Failure**18. Head Injury****19. Principles of Transfusion Therapy**

- Whole blood, erythrocyte products
- Plasma components
- Platelets concentrates, massive transfusion, acute transfusion reactions

Recommended Books (latest edition):

1. The Anaesthesia Technologist's Manual by Emily S Guimaraes, Matthew Davis, Jeffrey R Kirsch, Glenn Woodworth
2. Introduction to the Surgery by Marketa Duskova.

COURSE AND EXAMINATION REGULATIONS

Attendance:

- Students are required to attend 75% or more of all theory classes held, and 75% or more of practical in each subject to be eligible to appear in the final examination. Under no condition will a student with less than the prescribed attendance in any subject in theory and practical separately shall be allowed to appear in the Annual examination of that subject.
- Students with less than 75% attendance in theory and practical separately at the end of any year must start afresh by joining the junior batch of students. No extra classes will be arranged to make such students eligible for the final annual examinations. The attendance accrued in the previous academic year in those subject(s) will not be transferred. The student will need to secure 75% attendance afresh in theory and practical/laboratory postings after joining the junior batch to become eligible to appear in the final summative examination.
- The 25% leverage in attendance includes all types of leaves (including leave on medical grounds). For absence because of illness or any medical condition, a duly approved medical leave from Dean (Academic) with medical and fitness certificate issued/verified by authorized JIPMER clinical faculty member is mandatory. Certificate must be submitted before or within 10 days after availing medical leave.
- Students who are detained in all the subjects of a year due to lack of attendance should join the classes with junior batch within 7 days of declaration of the eligibility/detention list or when classes commence, whichever is earlier.
- Students who are detained in one or more subject(s) because of lack of attendance but are eligible to appear for final Annual examination in at least one subject of the year should join classes with junior batch within 7 days of completion of the last final theory/practical examination or when classes, whichever is earlier. Attendance will be calculated from the date of joining.
- A show cause notice will be issued to students on continuous unauthorized absence without prior permission for two weeks or more. If such absence extends to a period more than one month for any reason, the student is liable for termination for the course. The decision of the competent authority is final.
- There is **no condonation permissible** for shortage of attendance.

Internal Assessment (IA)

- A minimum of three notified internal assessments will be held periodically in each year (in a one-year period) and one model examination before the final annual examination.
- Each of the notified IA tests will carry 20% weightage and the model examination will carry 40% weightage. The sum of notified IA tests and model examination will decide the eligibility to appear in the examination and for contribution to aggregate marks.

- A student must secure at least 30% of the maximum marks fixed for internal assessment in theory and practical/clinical separately in a particular subject to be eligible to appear for the final annual examination in that subject.
- Of the final total aggregate marks in each subject, internal assessment marks will contribute 40% and annual examination marks will contribute the remaining 60%. This will apply to both theory and practical/clinical papers separately.
- If a student misses up to one notified test because of illness, marks of the remaining notified tests can be considered for calculating the internal assessment, ignoring the absence on medical grounds. To avail this concession, the student should submit a valid medical certificate signed by the treating clinical faculty member of JIPMER before or within 10 days after the missed test. This exemption will not apply to model examination. This is applicable only up to one missed notified internal assessment test.
- No repeat/additional notified internal assessment or model examination will be conducted.
- Students who are detained in all the subjects of a year because of lack of sufficient internal assessment marks should join the classes with junior batch within 7 days of declaration of the eligibility/detention list or when classes of the year commence, whichever is earlier.
- Students who are detained in one or more subject(s) due to lack of sufficient internal assessment marks but are eligible to appear in the annual examination in at least one subject of the year should join classes with junior batch within 7 days of completion of the last annual theory/practical examination or when classes of the year commence, whichever is earlier.
- The internal assessment marks accrued in the previous year will not be transferred to the next year.

Annual Examinations

Number and timing of examinations

- Annual examinations will be held at the end of each academic year. The Institute shall conduct not more than two annual examinations in an academic year, a regular annual and a supplementary examination in each subject. The supplementary examinations will be held within 6 weeks after publication of the result of the regular annual examination.
- Practical Examinations shall be jointly conducted by one internal and one external examiner duly appointed by the Professor of Examinations.
- Students should obtain a minimum of 40% in the annual examination and a minimum of 50% in the final total aggregate (total of internal assessment and annual examination marks) in a subject (theory and practical separately) to be declared as pass in that subject.

Marks scheme:

	Maximum marks
Theory	200
Practical	100
Total	300

Theory

	Maximum marks
Internal Assessment test 1 (weighted)	16
Internal Assessment test 2 (weighted)	16
Internal Assessment test 3 (weighted)	16
Model Examination	32
Annual Theory Examination	100
Viva-voce Examination	20
Total Theory marks	200

Practical

	Maximum marks
Internal Assessment test 1 (weighted)	7
Internal Assessment test 2 (weighted)	7
Internal Assessment test 3 (weighted)	7
Model Examination	14
Record marks	5
Annual Practical Examination	60
Total Practical marks	100

Question paper pattern

	Maximum marks
Section A	50
Section B	50
Total	100

Each section

		Marks
Answer in detail	1 X 10	10
Short notes	5 X 5	25
Brief answers	5 X 3	15
		50

Number of attempts and Training Period

- The academic program of the BSc Allied Health Sciences courses must be completed within 6 years from the date of joining (excluding internship). Maximum permissible duration for each year shall be four years and a maximum four attempts (including the annual and supplementary examinations) in any subject will be permitted.
- If a student does not appear in both theory and practical final examination, it will NOT be considered as an attempt for the purpose of calculation of maximum number of attempts in a subject.
- If a student appears for theory in the Annual Examination but does not appear for Practical Examination or vice-versa, his/her theory or practical appearance shall be counted as an attempt. In the next attempt, the student will have to appear for both Theory and Practical Examinations. Mere submission of application form for examination will not be considered as an attempt.
- Passing in the exams of all the previous year subjects is compulsory before proceeding to the classes of next phase.
- A student who fails in theory and/or practical papers of one or more subjects in the regular annual examinations at the end of each year can appear in the supplementary examination (to be held within 6 weeks of announcement of the regular annual examination results) in those subjects.
- If he/she passes these subjects in the supplementary examination, he/she should join the regular batch within 7 days of declaration of supplementary examination results or when classes commence, whichever is earlier. Attendance calculation for students who join after passing supplementary examination will begin from their date of joining of that year.
- Students who fail in theory and/or practical in one or more subjects in the supplementary examination and those who do not appear in the supplementary examination should join classes with the junior batch within 7 days of declaration of supplementary examination results or when classes, whichever is earlier. These students should secure 75% attendance and 30% internal assessment afresh to be eligible to appear in the final regular annual examination of that year along with the junior batch. Attendance calculation for students who join after failing in supplementary examination will begin from their date of joining the year with junior batch.
- A maximum of four attempts in any subject is allowed. If a student fails even in the 4th attempt, no further chances will be given, and his/her name will be struck off the rolls of JIPMER.
- No grace marks will be awarded for either theory or practical examinations under any circumstances.

Model Question paper**Phase I - Paper I: Foundation course**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A**1. Answer the following question in detail:**

1 x 10 = 10

- a. Describe in detail healthcare delivery system in India at the primary, secondary, and tertiary levels.

2. Write short notes on the following:

5 x 5 = 25

- a. What is the role of processor and RAM in a computer?
- b. Describe the types of networks in computing.
- c. Write a short note on right to healthcare.
- d. What is medical negligence? What are the laws governing medical negligence in India?
- e. Write in brief about the importance of informed consent and the process.

3. Answer the following questions briefly:

5 x 3 = 15

- a. What are the components of a medical term?
- b. What are the input and output devices of a computer?
- c. What is paralanguage? What are its implications?
- d. Describe the characteristics of good communicator.
- e. What are the alternative medicine systems recognised by the Government of India?

Section B**4. Answer the following question in detail:**

1 x 10 = 10

- a. Explain the concepts of quality of care. Describe various approaches to quality improvement.

5. Write short notes on the following:

5 x 5 = 25

- a. Describe the principles of management with suitable examples.
- b. Describe the methods of disinfection in biomedical waste management.
- c. Describe the methods of prevention & control of common healthcare associated infections.
- d. Classify the types of antibiotic resistance and describe each of them.
- e. Write a short note on research study designs.

6. Answer the following questions briefly:

5 x 3 = 15

- a. What are the components of cardiopulmonary resuscitation?
- b. What is integrity and what is its importance of integrity in healthcare practice?
- c. What are the qualities of a good leader?
- d. What are the different types of data?
- e. Describe the concept of ethics and its relevance in healthcare practice.

Model Question paper**Phase I - Paper II: Anatomy and Physiology**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A - Anatomy

- 1. Answer the following question in detail:** 1 x 10 = 10
- a. Describe the position, parts, structure, blood supply and supports of uterus.
- 2. Write short notes on the following:** 5 x 5 = 25
- a. Parts and blood supply of stomach
b. Simple epithelium
c. Histology of lymph node
d. Chambers and valves of heart
e. Surfaces and lobes of lung
- 3. Answer the following questions briefly:** 5 x 3 = 15
- a. Name three major salivary glands.
b. Mention two contents of spermatic cord
c. Name two paranasal air sinuses
d. Name the parts of small intestine
e. Name two upper limb muscles

Section – B - Physiology

- 4. Write essay answer on the following:** 1 x 10 = 10
- a. Define immunity. Mention the different types of immunity. Write briefly about the different types of immunity. (2+2+6)
- 5. Write short notes on the following:** 5 x 5 = 25
- a. Active transport
b. Movements of small intestine
c. Factors affecting glomerular filtration rate
d. Oxygen haemoglobin (Oxy-Hb) dissociation curve
e. Factors regulating cardiac output
- 6. Answer the following questions briefly:** 5 x 3 = 15
- a. Name the hormones secreted from Adrenal gland
b. Mention the Indicators of ovulation
c. Define tidal volume. Mention its normal value.
d. Draw a labelled diagram of lead II ECG.
e. List four functions of hypothalamus.

Model Question paper**Phase I - Paper III: Pathology and Microbiology**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A - Pathology**1. Answer the following question in detail:** 1 x 10 = 10

- a. What is inflammation? What are the cardinal signs of inflammation? Mention the difference between acute and chronic inflammation. Add a note on granuloma with example. (1+2+4+3)

2. Write short notes on the following: 5 x 5 = 25

- a. Define necrosis. Give examples of different types of necrosis. Differences between necrosis and apoptosis.
- b. What is thrombosis? Explain Virchow's triad.
- c. Define neoplasia. What are the differences between benign and malignant tumours? List the different routes of metastasis.
- d. Mention the differences between wound healing by primary and secondary intention.
- e. Principles and procedures of blood grouping and cross-matching.

3. Answer the following questions briefly: 5 x 3 = 15

- a. Define anaemia. Give any two causes of anaemia.
- b. What is jaundice? Give the classification based on pathophysiology.
- c. What is atherosclerosis? Give some of its risk factors.
- d. What is nephrotic syndrome? Give any two examples.
- e. How will you do urine analysis?

Section – B - Microbiology**4. Write essay answer on the following:** 1 x 10 = 10

- a. Define sterilization. Draw a labelled diagram of autoclave. Write principle of autoclave and its application in hospital. (1+3+3+3)

5. Write short notes on the following: 5 x 5 = 25

- a. Enumerate vector borne diseases. Add a note on the laboratory diagnosis of malaria
- b. What do you understand by segregation of biomedical waste? How is it done in your hospital?
- c. Describe in detail about various method of urine sample collection
- d. Enumerate sexually transmitted microorganisms. Write laboratory diagnosis of HIV
- e. Describe laboratory diagnosis of Mucormycosis.

6. Answer the following questions briefly: 5 x 3 = 15

- a. Name two transport media
- b. Name two foodborne pathogens
- c. Enumerate four Personal Protective Equipment (PPE)
- d. Name two nosocomial pathogens
- e. List two opportunistic fungal infection

Model Question paper**Phase I - Paper IV: Biomedical Sciences & Introduction to Anaesthesia technology**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A

- 1. Answer the following question in detail:** 1 x 10 = 10
- a. Describe Fiber optics technology. Explain the application of fiber optics in medical equipment design
- 2. Write short notes on the following:** 5 x 5 = 25
- a. Explain any four parameters in a multipara monitor
b. What is the process of Laser formation?
c. Types of physiological effects of current.
d. Explain Defibrillator.
e. How a multimeter is used to measure voltage and current with diagram
- 3. Answer the following questions briefly:** 5 x 3 = 15
- a. Different types of batteries and their uses
b. Explain radiation.
c. Application of sound waves.
d. Difference between AC & DC
e. What are transverse waves?

Section – B

- 4. Write essay answer on the following:** 1 x 10 = 10
- a. What is a central manifold? Elaborate on the things you will check in the manifold. Add a note on safety precautions to be taken in a manifold.
- 5. Write short notes on the following:** 5 x 5 = 25
- a. Enlist the things to be kept ready prior to the surgery in the operating room.
b. Draw the flow diagram of anaesthesia workstation
c. Explain the equipment for anaesthetic agents.
d. Explain Laminar flow system.
e. Explain working principle of diathermy with neat diagram
- 6. Answer the following questions briefly:** 5 x 3 = 15
- a. Explain Potentiometer.
b. Explain the safety devices used in medical equipment.
c. Define thermopile and thermostat.
d. Explain the modes of heat transfer.
e. List out any two applications of Ultrasound imaging system.

Model Question paper**Phase II - Paper I: Principles of Anaesthesia**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A**1. Answer the following question in detail:** 1 x 10 = 10

- a. Describe in detail the components of circle breathing system

2. Write short notes on the following: 5 x 5 = 25

- a. Which size Proseal LMA you will choose for 8 kg infant, how will you prepare, clean and sterilize it?
- b. Working principle of pulse oximetry.
- c. How will you troubleshoot a CO₂ analyzer with no trace on the monitor?
- d. How does oxygen supply failure safety device work?
- e. Components of scavenging system.

3. Answer the following questions briefly: 5 x 3 = 15

- a. Any two disorders of cardiovascular system
- b. Functions of sodalime
- c. Nitrous oxide cylinder.
- d. Handwashing technique
- e. What are transverse waves?

Section – B**4. Write essay answer on the following:** 1 x 10 = 10

- a. Describe the structure and functions of oxygen pressure regulator

5. Write short notes on the following: 5 x 5 = 25

- a. Measures to prevent hypothermia during anaesthesia.
- b. Maintenance of anaesthesia ventilators.
- c. Classify humidifiers and mention four uses of humidification.
- d. How will you troubleshoot lower than expected vapor output from vaporizer?
- e. Non-invasive blood pressure monitoring

6. Answer the following questions briefly: 5 x 3 = 15

- a. Name any two metabolic acid-base disturbances
- b. Any two complications of mechanical ventilation
- c. Coverings of spinal cord
- d. Monitors in intensive care unit
- e. Vital signs

Model Question paper**Phase II - Paper II: Basic Anaesthetic techniques**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A**1. Answer the following question in detail:** 1 x 10 = 10

- a. Describe different types of endotracheal tubes, their uses, method stop confirm the correct tube position after placement.

2. Write short notes on the following: 5 x 5 = 25

- a. NYHA Classification
- b. Mallampatti grading of the airway
- c. Blood components
- d. Different methods of anaesthesia
- e. Tray set up for a regional anaesthetic procedure

3. Answer the following questions briefly: 5 x 3 = 15

- a. Structure of epidural needle
- b. Name any two types of vaporisers
- c. Any two complications of spinal anaesthesia
- d. Name any two non-depolarizing agent
- e. Name any two drugs kept in emergency tray

Section – B**4. Write essay answer on the following:** 1 x 10 = 10

- a. Discuss in detail pre-operative assessment, pre-medication and investigations required for a patient undergoing surgery under general Anaesthesia.

5. Write short notes on the following: 5 x 5 = 25

- a. Preoperative assessment of respiratory system
- b. Pre-operative indications for blood transfusion
- c. Position for tonsillectomy procedure and its importance
- d. Renal function test
- e. Spinal needles

6. Answer the following questions briefly: 5 x 3 = 15

- a. Colour coding of gas cylinders
- b. Name any two reversal agents
- c. Use of guide wire in anaesthesia
- d. Positive pressure ventilation
- e. Name any two commonly used local anaesthetics

Model Question paper**Phase II - Paper III: Medical comorbidities related to Anaesthesia**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A**1. Answer the following question in detail:**

1 x 10 = 10

- a. Explain in detail about the different types of anaemia and write a note on iron deficiency anaemia.

2. Write short notes on the following:

5 x 5 = 25

- a. Coronary heart disease
- b. Candidiasis
- c. Haemodialysis
- d. Eczema
- e. Liver abscess

3. Answer the following questions briefly:

5 x 3 = 15

- a. Name any two anti-hypertensive drugs
- b. Hypersensitivity reactions
- c. Methods to prevent aspiration during anaesthesia
- d. Mention two resuscitative fluids and their composition.
- e. Status epilepticus

Section – B**4. Write essay answer on the following:**

1 x 10 = 10

- a. Define obesity. Explain in detail blood pressure monitoring in an obese hypertensive patient. How to choose the appropriate cuff size in adult patients?

5. Write short notes on the following:

5 x 5 = 25

- a. Diabetes mellitus
- b. Extradural hematoma
- c. General physical examination
- d. Leprosy
- e. Haemorrhagic shock

6. Answer the following questions briefly:

5 x 3 = 15

- a. Sources of infection
- b. Glucose monitoring
- c. Intracranial hypertension
- d. Hemiplegia
- e. Pneumonia

Model Question paper**Phase III - Paper I: Basics of surgery, sterilization, safety, and crisis management**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A**1. Answer the following question in detail:** 1 x 10 = 10

- a. Write in detail about the preoperative and the postoperative care of surgical patients.

2. Write short notes on the following: 5 x 5 = 25

- a. Sterilization
- b. Importance of teamwork during surgery
- c. Inflammatory process
- d. Abscess
- e. What are the phases of the WHO Surgical Safety Checklist?

3. Answer the following questions briefly: 5 x 3 = 15

- a. What is infiltration anaesthesia?
- b. What is Bier's block?
- c. Two methods to prevent mismatch blood transfusion.
- d. Any two types of intravenous fluids that may be used
- e. Mention any two post-surgical wound problems

Section – B**4. Write essay answer on the following:** 1 x 10 = 10

- a. Write in detail about the settings of laparoscopic surgery

5. Write short notes on the following: 5 x 5 = 25

- a. Inflammatory process
- b. Dry heat sterilization
- c. Cleaning of catheters and tubes
- d. Initial management of electric burns
- e. Treatment of a patient with duodenal ulcer

6. Answer the following questions briefly: 5 x 3 = 15

- a. Disposal of sharps
- b. Any two chemical disinfectants
- c. Different sizes of available suture materials
- d. Any four fire safety precautions inside operation room
- e. Any two positioning of surgical patients

Model Question paper**Phase III - Paper II: Anaesthesia technology for speciality surgeries**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A**1. Answer the following question in detail:**

1 x 10 = 10

- a. What is the Glasgow Coma Scale. How does it help in management of patients with severe head injury?

2. Write short notes on the following:

5 x 5 = 25

- a. Preparing a paediatric patient for anaesthesia and surgery
- b. Precautions to be taken during extubation of a child after tonsillectomy
- c. NYHA Classification
- d. Preparations for anaesthesia outside operating theatre
- e. Premedication

3. Answer the following questions briefly:

5 x 3 = 15

- a. Name two sites of neuromuscular transmission monitoring sites.
- b. Name two drugs for prevention of postoperative nausea vomiting.
- c. Name two airway positioning technique for intubation in obese patients.
- d. How will you prevent airway injuries while using "Frova" intubation aid?
- e. Name two cardiac arrest rhythms.

Section – B**4. Write essay answer on the following:**

1 x 10 = 10

- a. Describe the airway management of patients undergoing airway sharing surgeries and measures to prevent accidental extubation?

5. Write short notes on the following:

5 x 5 = 25

- a. Checks to be performed before taking a multichannel monitor for transport
- b. Check to be performed before starting an infusion on syringe pump during patient transfer
- c. What do you do if you see soiled ventilator tubing on a patient getting mechanically ventilated?
- d. Draw a normal CVP trace and label the parts
- e. Precautions to be taken to prevent infection in a patient with central Line

6. Answer the following questions briefly:

5 x 3 = 15

- a. Pressure transducer setup
- b. Name two electrocardiogram changes during myocardial ischemia or infarction
- c. Two clinical signs of anaphylaxis
- d. Name two oxygen delivery devices in neonates and infants
- e. Two components of high-quality Cardiopulmonary Resuscitation

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Model Question paper**Phase III - Paper III: Basic Critical Care relevant to Anaesthesia technology**

Maximum marks: 100

Maximum duration: 3 hours

Answer all the questions. Draw suitable diagrams where necessary

Section A**1. Answer the following question in detail:**

1 x 10 = 10

- a. What is the Glasgow Coma Scale? How does it help in management of patients with severe head injury?

2. Write short notes on the following:

5 x 5 = 25

- a. Non-invasive ventilation
- b. Calibration of medical equipment
- c. Maintenance of ECG machines
- d. Safety alarms on mechanical ventilators
- e. Management sudden hypoxia on a ventilated patient

3. Answer the following questions briefly:

5 x 3 = 15

- a. Name two precautions to be taken while inserting a central line.
- b. How will you sample an arterial line for blood gas analysis?
- c. Name two devices used for humidification in an intubated and ventilated patient.
- d. Name two drugs used during cardiopulmonary resuscitation.
- e. Name two airway devices

Section – B**4. Write essay answer on the following:**

1 x 10 = 10

- a. How will you care for a patient on invasive mechanical ventilation with an endotracheal tube?

5. Write short notes on the following:

5 x 5 = 25

- a. Checks to be performed before taking a multichannel monitor for transport
- b. Check to be performed before starting an infusion on syringe pump during patient transfer
- c. What do you do if you see soiled ventilator tubing on a patient getting mechanically ventilated?
- d. Draw a normal CVP trace and label the parts
- e. Precautions to be taken to prevent infection in a patient with central Line

6. Answer the following questions briefly:

5 x 3 = 15

- a. Draw a picture of a laryngoscope and label its parts.
- b. Name the routes of giving nutrition in ICU patients.
- c. Define cardiac arrest?
- d. Indications for platelet transfusion.
- e. Precautions to be taken before transfusing blood to a patient.
