

The background of the cover features a blurred image of medical equipment in an operating room, including a ventilator with a 'SEVOFLURANE' label and various monitors. A dark teal semi-transparent box is overlaid on the center, containing the title and program details. At the bottom, there is a decorative pattern of hexagonal shapes with molecular structures inside, and the UITM logo is visible in the bottom right corner.

PROGRAMME GUIDEBOOK

MASTER OF ANAESTHESIOLOGY & CRITICAL CARE (UITM)

DEPARTMENT OF ANAESTHESIOLOGY & INTENSIVE CARE,
FACULTY OF MEDICINE
UNIVERSITI TEKNOLOGI MARA



UNIVERSITI
TEKNOLOGI
MARA

SECOND EDITION 2022

**MASTER OF ANAESTHESIOLOGY
& CRITICAL CARE**

STUDENT'S GUIDEBOOK

M ANAES & CRITCARE (UiTM)

FACULTY OF MEDICINE

UNIVERSITI TEKNOLOGI MARA

SESSION 2022/2023

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PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The Master of Anaesthesiology & Critical Care programme aims to impart knowledge and clinical skills to candidates. This is to enable the candidates to function as safe and competent anaesthesiologists.

The PEO's are to produce an anaesthesiologist with:

1. Knowledge in basic medical sciences, anaesthesiology & critical care in terms of theory, clinical skills and managing cases effectively and holistic manner.
2. Demonstrable competent clinical skills to function as an anaesthesiologist, able to manage patients comprehensively in physical, psychosocial, and spiritual aspects in anaesthesiology & critical care based on the current medical evidence to minimize the risk of perioperative morbidity and mortality.
3. Ability to relate to self, patients and their families, colleagues, and the community ethically and humanely.
4. Demonstrable professionalism, accountability, and commitment in their work in terms of ethics, local culture, and religion.
5. Ability to communicate effectively both individually and within interdisciplinary teams. Demonstrate leadership and teamwork qualities in managing anaesthesiology & critical care and other related healthcare services.
6. Ability to recognize the need and engage in scientific clinical research related to anaesthesiology & critical care to strengthen evidence-based decision-making.
7. Interest in continuous self-improvement and life-long learning through the usage and application of the latest technology and digital skill in anaesthesiology & critical care.

PROGRAMME LEARNING OUTCOMES (PLO)

At the end of the programme, the candidate can:

1. Apply the knowledge and expertise in basic medical sciences, anaesthesiology & critical care. Able to think critically in making a clinical diagnosis and solving problems optimally and holistically.
2. Manage perioperative anaesthesia competently while ensuring patient safety.
3. Work professionally while showing compassion towards patients, family members and the community.
4. Make a sound clinical decision considering the social, ethical and health economic status.
5. Demonstrate effective communication and interpersonal skill among colleagues, patients, families, and the community. Responsible and able to lead and work as a team in managing anaesthesiology & critical care and health care services.
6. Conduct research related to anaesthesiology & critical care to strengthen evidence-based decision-making.
7. Provide effective and optimal care in anaesthesiology & critical care by applying the latest technology and digital skills.
8. Demonstrate entrepreneurial skills by managing and organizing professional development programmes in anaesthesiology & critical care and other related activities benefiting the fraternity and community.

CURRICULUM STRUCTURE

- The curriculum structure is aimed at allowing progressive proficiency in knowledge, clinical skills, attitude and responsibilities.
- The duration of the study is four (4) years and is divided into three (3) phases. The maximum duration of the study is seven (7) years.
- The programme is divided into two parts: clinical training & academic teaching sessions and a research project.
- The candidates shall undergo full-time clinical training in various fields of anaesthesiology & intensive care for 48 months. In the 'Closed System,' candidates will do their training in UiTM Hospitals. Candidates who are registered in the "Open System" shall undergo Year 1 and Year 2 training in MOH hospitals accredited for the programme by the UiTM and/or Conjoint Board of Anaesthesiology & Critical Care. The Year 3 and Year 4 training must be done in UiTM Hospitals. Year 3 and Year 4 training may be done in any accredited MOH hospital, but it will require approval from the Department of Anaesthesiology & Intensive Care, Faculty of Medicine UiTM.

Phase 1: Junior Medical Officer in Anaesthesiology & Critical Care

Year 1

- The general objective is to enable candidates to acquire knowledge in Basic Medical Sciences and the principles of anaesthesiology & critical care. The candidates have to apply their knowledge in clinical problem-solving and decision-making processes in patient management. They shall also have to perform clinical procedures under supervision.
- The candidates shall learn the fundamentals of anaesthesiology & critical care, focusing on applied physiology & clinical measurements, pharmacology, and basic clinical skills in anaesthesiology & critical care.
- Candidates are required to sit for the Part 1 (Primary) Conjoint Board Examination. The examination is conducted as Conjoint Examination with other universities offering similar courses in anaesthesiology & critical care. A re-examination is conducted every 6 months. The maximum number of attempts allowed is 4 (with 1 appeal when appropriate). Candidates are not

allowed to proceed to 2nd year until they pass the Part 1 (Primary) Conjoint Board Examination.

Phase 2: Senior Medical Officer in Anaesthesiology & Critical Care

Years 2 & 3

- The general objective is to enable the candidates to develop the candidates' proficiency in the practice of anaesthesiology & critical care.
- The candidates will be taught basic research methodology and will have to submit a research proposal. The candidates will learn about sub-speciality fields of anaesthesiology & critical care, neuro anaesthesia, pain, intensive care, cardiothoracic and vascular anaesthesia, obstetric anaesthesia, paediatric ICU and paediatric anaesthesia.

Phase 3: Anaesthetic Registrar

Year 4

- The general objective is to develop the candidates to function as registrars in anaesthesiology & critical care. The candidates will be able to perform as the right-hand person to the consultant.
- Learning process for the candidates will be on advanced anaesthesiology & critical care. The candidates will be treated as registrars in training.
- The candidates shall be required to submit a research dissertation 6 months before they are allowed to sit for the Part 2 (Final) Conjoint Board Examination. The examination shall be conducted as a *conjoint examination* with other universities offering similar courses in anaesthesiology & critical care. The re-examination shall be conducted at 6 monthly intervals. The maximum of attempts is dependent on the maximum duration of the study which is seven (7) years.

PROGRAMME SUMMARY

	Phase 1	Phase 2		Phase 3
	Year 1	Year 2	Year 3	Year 4
Anaesthesiology & Critical Care Clinical Training	<p>Junior Medical Officer in Anaesthesiology & Critical Care (Focus on basic medical sciences relevant to anaesthesiology & critical care)</p> <p><u>Basic Medical Sciences (BMS)</u></p> <ul style="list-style-type: none"> • Physiology • Clinical Measurements • Pharmacology <p><u>Exam</u> Part 1 (Primary) Conjoint Board Examination (End of 12 months)</p>	<p>Senior Medical Officer in Anaesthesiology & Critical Care (Focus on an advanced subspecialty in anaesthesiology & critical care)</p> <p><u>Sub-speciality</u></p> <ul style="list-style-type: none"> • Intensive care (3 months) • Vascular (1 month) • Cardiothoracic (2 months) • Maxillofacial-dental anaesthesia (1 month) • Paediatric anaesthesia (1 month) • Paediatric ICU (1 month) • Obstetric anaesthesia & analgesia (3 months) • Orthopaedics (1 month) • Respiratory (1 month) • Cardiology (1 month) <p><u>Others</u> Physics & Equipment Research Methodology Miscellaneous topics</p>		<p>Registrar in Anaesthesiology & Critical Care</p> <p><u>Sub-speciality</u></p> <ul style="list-style-type: none"> • Ophthalmology (1 month) • ORL (1 month) • Urology (1 month) • Hepatobiliary (1 month) • Bariatric (1 month) • Neuroanaesthesia/ intensive care (2 months) • Intensive Care (3 months) • Pain (2 months) <p><u>Others</u> Statistics</p> <p><u>Exam</u> Part 2 (Final) Conjoint Board Examination (6 months after submission of dissertation)</p>

	Phase 1	Phase 2		Phase 3
	Year 1	Year 2	Year 3	Year 4
Dissertation Project	<ul style="list-style-type: none"> • Preparing research proposal for dissertation 	<ul style="list-style-type: none"> • Proposal presentation • Data collection • Analysis and interpretation of data • Summary <p>Note: at end of 3rd Year, write up of dissertation should have been read & edited by the supervisor</p>	Data analysis & Write up	<ul style="list-style-type: none"> • Submission of dissertation • <i>Submission for journal publication</i>
Course / Workshops	<ul style="list-style-type: none"> • Basic Life Support (BLS) • Advanced Cardiac Life Support (ACLS) • Part 1 (Primary) Conjoint Intensive Course 	<ul style="list-style-type: none"> • Good Clinical Practice Workshop • Research Methodology Course 	<ul style="list-style-type: none"> • Airway Management Workshop • Ultrasound Guided Regional Block Workshop 	<ul style="list-style-type: none"> • Part 2 (Final) Conjoint Intensive Course

DISSERTATION PROJECT

(For details, please refer to Thesis Guideline for Master of Anaesthesiology & Critical Care UiTM)

- Submission of a research dissertation is a prerequisite for a candidate to sit for the Part 2 (Final) Conjoint Board Examination.
- Every candidate will be given a booklet 'Guideline for Master of Anaesthesiology & Critical Care (UiTM)' as a reference.
- Candidates shall be required to attend the Research Methodology Course and Good Clinical Practice (GCP) Workshop conducted by the Postgraduate Secretariat/ UiTM hospital/ MOH hospitals.
- This workshop is aimed to develop skills in preparing a research protocol, conducting a research project, and writing up the manuscript.
- The course will cover concepts of research, objectives, critical appraisal, research problems and literature reviews.
- This research project should be started after passing Part 1 (Primary) Conjoint Board Examination i.e., from Semester 3 to Semester 7.

Stages of the Dissertation

Candidates would need to

- Identify a suitable topic for the research project and discuss the topics with the supervisor. This should be done after the candidate has passed the Part 1 (Primary) Conjoint Board Examination.
- Review the literature pertinent to the topic of the research project and ensure the research project is publishable.
- Develop a research protocol with guidance from the supervisor.
- Present the protocol and submit the proposal to the Department of Anaesthesiology & Intensive Care, UiTM.
- Start data collection after ethical committee approval.
- Engage with the supervisor for progress assessment and evaluation.
- Follow the research format as written in the Guide for Thesis Guidelines for Master of Anaesthesiology & Critical Care UiTM.

- Submit the completed dissertation project 6 months before the Part 2 (Final) Conjoint Board Examination.
- Deliver an oral presentation to the Department before submission for assessment by the external examiners.
- Publish their research project in a national or international journal.

ASSESSMENT TOOLS

- The candidates must have a sense of belonging to the department.
- The candidates must be committed as an integral part of the clinical service team and function as effective apprentices to the supervisor. The clinical services they provide to the hospital are a part of the learning process.
- Besides learning how to take care of patients in the wards, operation theatres and ICU, the candidate must learn and develop work qualities and managerial and leadership skills. They are expected to be self-directed learners to improve their work performance.
- The assessment tools used are related to the clinical practice. Candidates are encouraged to meet and discuss their performance regularly with their supervisors, get feedback and subsequently take the initiative to look for more relevant information for further improvement.
- The tools used to assess different competencies i.e.
 - ✓ Supervisor's evaluation 6-monthly progress report
 - ✓ Logbook of clinical cases and procedures
 - ✓ Participation in continuous medical education (CME), clinic-pathological conference (CPC), mortality & morbidity (M&M) and Journal Club activities

Supervisor's Evaluation Report

- All candidates will be closely monitored by his/her supervisor throughout the programme. The competencies and qualities to be assessed and the criteria for evaluation are stated in the evaluation form.
- The candidates are expected to develop the competencies and qualities, aiming for excellence in BMS and clinical services.
- The candidates are encouraged to use the evaluation report as a guideline for progress and to engage with the supervisor for advice throughout the programme. The supervisor is expected to provide regular feedback to motivate the candidates based on the candidate's achievements.

Logbook

- At the beginning of each academic year, the candidate is required to use a new logbook to record all procedures performed.
- When a skill is done, the candidate should fill out the logbook and get it signed by the supervisor/specialist who will assess and determine the level of competency.
- The logbook should be certified by the candidate's supervisor at the end of each semester.
- Several clinical skills/specialized techniques/clinical procedures are listed in the logbook.
- The candidates and supervisor should use the logbook as a guide to indicate personal progress and achievement throughout the training process.
- Candidates are required to maintain an up-to-date record of the clinical procedures they have performed.

SUPERVISION

Every candidate will be supervised by one or more lecturers during the duration of the study.

Among the duties of a supervisor is to guide the candidate in his/her studies and research project and to write a six (6) monthly performance appraisal of the candidate. A training coordinator coordinates the running of the programme in each training hospital. All training coordinators are responsible to the Programme Coordinator who is the Chief Supervisor of Training for the programme.

ANNUAL LEAVE AND ALLOWANCE DUE TO ILLNESS

Annual Leave

- Candidates are entitled to take 28 days of annual leave with a maximum of 14 days per semester. The remaining days of annual leave cannot be carried forward to the next semester.
- The training period of the candidate will be extended if the length of leave exceeds the maximum number of days entitled per semester.

Allowance due to Illness

- Candidates are given an allowance due to illness (sick leave) of 14 days per year, inclusive of weekends and public holidays.
- If a candidate requires allowance due to illness which exceeds the maximum allocated, this additional leave will be deducted from the annual leave.
- Allowances due to illness can only be claimed for the current year of training and cannot be carried forward to the following year.
- Medical certificates issued by clinics, government or private hospitals are accepted.

Leave Approval

Leave approval for the candidate is subject to approval by the respective heads of departments.

Candidates are not allowed to be absent from the programme for more than 42 days per year (combined allowance due to illness and annual leave). If exceeds 42 days per year, the candidate will need to defer his/her study.

DEFERMENT OF STUDY

- A candidate is allowed to defer his/her study for not less than one (1) semester and not more than two (2) semesters.
- A written application must be submitted through the respective Head of Department and addressed to the Deputy Dean (Postgraduate), Faculty of Medicine UiTM.
- The candidate who has been granted a deferment is responsible to inform his/her respective sponsor and is required to report back to her usual workplace during the deferment period.

EXAMINATION

The Master of Anaesthesiology & Critical Care examinations are designed to test the knowledge and ability of the candidates in the fields of anaesthesiology, intensive care and pain management. There are two (2) examinations:

Part 1 (Primary) Conjoint Board Examination

The examination is aimed to assess the candidates' knowledge in physiology, pharmacology, clinical measurement, basic principles of anaesthesiology & critical care and application of the knowledge in problem-solving and decision-making. It consists of written components, which are the Multiple-Choice Questions (MCQ), Short Answer Questions (SAQ) and Viva-voce. The examination is conducted every 6 months. A candidate is allowed a maximum of four (4 attempts) at the examination within a period of two (2) years.

The subjects and components of the examination and the marks to be allocated for each subject and component are as follows:

Part 1 (Primary) Conjoint Examination Format

Part 1 (Primary) Conjoint Examination			
Pharmacology	Number of Questions	Duration (min)	Marks (%)
Paper 1 (MCQ)			
MTF	30	90	30
SBA	30		
Paper 2			
SAQ	6	120	30
Viva Voce *			
i) Table 1	2 examiners + 1 observer	20	20
ii) Table 2	2 examiners + 1 observer	20	20
Total			100 %

* There will be 5 minutes waiting time before each table.

Physiology & Clinical Measurements	Number of Questions	Duration (min)	Marks (%)
Paper 1 (MCQ)			
MTF	30	90	30
SBA	30		
Paper 2			
SAQ	6	120	30
Viva Voce*			
i) Table 1	2 examiners + 1 observer	20	20
ii) Table 2	2 examiners + 1 observer	20	20
Total			100 %

* There will be 5 minutes waiting time before each table.

(MCQ: Multiple Choice Questions, MTF: Multiple True-False SBA: Single Best Answer, SAQ: Short Answer Question)

The written components of the examination (MCQ and SAQ) will be held not later than six (6) weeks before the Viva-voce. Only those candidates who have passed the written component of the examination will be invited to attend the Viva-voce. Candidates are deemed to have passed Part 1 (Primary) Conjoint Board Examination only after passing both components successfully.

Part 2 (Final) Conjoint Board Examination

The examination comprises the written theory, medical clinical and viva-voce.

The examination shall be based on the candidate's knowledge of the theory and practice of anaesthesiology & critical care, general medicine and surgery relevant to anaesthesiology & critical care management.

The components of Part 2 (Final) Conjoint Board Examination and the marks to be allocated for each component are as follows:

Part 2 (Final) Conjoint Examination Format

Components	Number of Questions	Duration (mins)	Marks
Written			40%
Paper 1: MCQ (SBA)	80	120	20
Paper 2: SAQ	6	120	20
Oral	Tables	Duration (mins)	60%
1) Viva voce in Anaesthesia and Intensive Care	<u>2 tables</u> Each table:2 examiners +/- observer	(15 x 2) x 2	20 marks each (total 40)
2) Medical long case (case summary) and Data interpretation	<u>1 table</u> 2 examiners +/- observer	15 x 2	20
Total			100 %

(MCQ: Multiple Choice Questions, SBA: Single Best Answer, SAQ: Short Answer Question)

All examinations comply with the Conjoint Board of Anaesthesiology & Critical Care Examination Rules and Regulation.

The Written components of the examination (MCQ and SAQ) will be held not later than six (6) weeks before the Viva-vice. Only those candidates who have passed the Written component of the examination will be invited to attend the Clinical component of the examination. Candidates are deemed to have passed the Part 2 (Final) Conjoint Examination only after passing both components successfully.

Re-Examination

Part 1 (Primary) Conjoint Board Re-Examination

- A candidate who has failed the Part 1 (Primary) Conjoint Board Examination may be permitted for re-examination on three separate occasions at six (6) monthly intervals.
- The Part 1 (Primary) Conjoint Board Re-Examination shall consist of the same components and shall be assessed and graded in the same manner as prescribed for the Part 1 (Primary) Conjoint Board Examination.
- A candidate who fails the re-examination on the fourth occasion shall be deemed to have failed the Part 1 (Primary) Conjoint Board Examination and shall not be permitted to repeat the programme of study except in special/unusual circumstances on the recommendation of the Faculty of Medicine UiTM and with approval by the Senate.

Part 2 (Final) Conjoint Board Re-Examination

- A candidate who has failed the Part 2 (Final) Conjoint Board Examination may be permitted for re-examination on three (3) separate occasions at six (6) monthly intervals.
- The Part 2 (Final) Conjoint Board Re-Examination shall consist of the same components and shall be assessed and graded in the same manner as prescribed for the Part 2 (Final) Conjoint Board Examination.
- Re-examination is conducted at 6-monthly intervals. The maximum number of attempts is dependent on the maximum duration of the study which is seven (7) years.

- A candidate whose dissertation is deemed unsatisfactory by the Committee of Examiners may be referred for further work in his research report over a period to be determined by the Committee of Examiners, which should not exceed six (6) months on any one occasion. At the end of the prescribed period, the candidate shall be required to submit the research report for re-examination.
- A candidate who fails to submit the research report by the end of the prescribed period for re-examination shall be deemed to have failed the research report.
- A candidate shall be permitted to submit his research report for re-examination on not more than two occasions.
- A candidate who fails the research report after the second re-examination shall be deemed to have failed the dissertation and shall not be permitted to repeat the programme of study except in exceptional circumstances on the recommendation of the Faculty of Medicine and with the approval of the Senate.
- A candidate who has passed the re-examination for the examinations mentioned above shall be deemed to have passed the prescribed examinations.

Board of Examiners

Members of the Board of Examination are appointed by the university. They consist of external (local and overseas) and internal examiners.

Termination of Training

Subject to the Senate approval, a candidate's training may be terminated if he/she has:

1. A consistently deficient performance appraisal.
2. Breached the set regulation.
3. Found to give false statements in his application.
4. Been proven guilty of malpractice and/or crime.
5. Been deregistered by the Malaysian Medical Council.
6. Failed to register within 30 days of the academic session without a written permission from the university.
7. Does not pass the Part 1 (Primary) Conjoint Board Examination after four (4) attempts.
8. Has been in the programme for a maximum of seven (7) years.

Appeal

A student who has been terminated from training due to the reasons stated above, may appeal against the decision. An official application to appeal should be made through the faculty within 14 days of receiving the letter of notification.

Appeal procedures to Conjoint Board Examinations are as follows:

1. Part 1 (Primary) Examination

A candidate who fails the examination on the 4th attempt shall be deemed to have failed the Part 1 (Primary) examination and shall be terminated from the programme. He or she may appeal to the University to re-sit the examination for the 5th attempt, and this process must first go through the department. The department's postgraduate committee will discuss the candidate's performance in the last three (3) previous examination results in deciding whether to support the appeal or otherwise. The appeal will be forwarded to the Postgraduate & Professional Training Office and presented to the Faculty Dean and final approval will be from the university senate.

2. Part 2 (Final) Examination

A candidate who has failed the Part 2 (Final) may be permitted a re-examination on at 6 monthly intervals. The maximum number of attempts is dependent on the maximum duration of the study which is 7 years. The candidate who has failed his or her last attempt at the examination shall be terminated from the programme. The candidate may appeal to the University to re-sit the examination and the candidate's performance in both written papers and oral examinations in the previous examinations will be discussed thoroughly by the department's postgraduate committee in deciding whether to support the appeal or otherwise. The appeal will be forwarded to the Postgraduate & Professional Training Office and presented to the Faculty Dean and final approval will be from the university senate.

Degree Conferment

A candidate will be granted the Master of Anaesthesiology and Critical Care degree if he/she:

1. Passes the Part 1 (Primary) Conjoint Board Examination
2. Passes the Part 2 (Final) Conjoint Board Examination
3. Shows proof to the Secretariat of Post-Graduate of:
 - a. Submission of one (1) his/her manuscript to a peer-reviewed journal
OR
 - b. Presentation of at least one (1) research paper at a local/international conference OR
 - c. Publish in one (1) proceeding

Awards

Award of Pass with Distinction in The Examination

A candidate may be awarded a Pass with Distinction in Part 1 (Primary) Conjoint Board Examination and the Part 2 (Final) Conjoint Board Examination with the following conditions:

- Has obtained 75% or more of the aggregate marks in each of the prescribed examinations.
- Has not failed in any component of the prescribed examination.
- Has not repeated the prescribed examination or any part of the programme of study except on medical or compassionate grounds approved by the Faculty of Medicine.

Award of the Master of Anaesthesiology and Critical Care with Distinction

A candidate may be awarded the Master of Anaesthesiology and Critical Care with Distinction with the following conditions:

- Has passed with Distinction in the Part 2 (Final) Conjoint Board Examination.
- Has not failed in any component of the prescribed examination.
- Has not repeated the prescribed examination or any part of the program of study except on medical or compassionate grounds approved by the Faculty of Medicine.

SYLLABUS / MODULE CONTENT

PART 1 (Primary) Master of Anaesthesiology and Critical Care

The Part 1 (Primary) Conjoint Board Examination has the following subjects:

- a) Physiology & Clinical Measurements
- b) Pharmacology

The following should be considered as a guide to indicate the general scope of preparation necessary for the examination.

PHYSIOLOGY (Phase 1/ Year 1)

Candidates should have a good understanding of human physiology and the principles and techniques of their measurement, common pathological conditions and the changes that occur during clinical practice. Candidates are expected to be able to apply this knowledge in clinical practice.

PHYSIOLOGY (Phase 1 / Year 1)

NO.	TOPICS	
1.	CELLULAR PHYSIOLOGY	
	<ul style="list-style-type: none"> • Function of cells, cellular components, and functions of the organelle • Characteristic of cell membranes: semi-permeable and properties • Osmosis • Gibbs-Donnan equilibrium and its physiological effects 	<ul style="list-style-type: none"> • Composition & regulation of extra-intracellular fluids • Mechanisms by which substances are transported across cell membranes • The role of receptors & the functions of secondary messengers • The role of G-proteins
2.	RESPIRATORY SYSTEM	
	<i>Basic anatomy and functions of alveolar & conducting airways</i> <ul style="list-style-type: none"> • Anatomy and functions upper of respiratory tracts • Anatomy of broncho-pulmonary segments • Humidification and heat exchange • Non-respiratory function of the lungs 	<ul style="list-style-type: none"> • Flow dynamics • Anatomy and types of dead spaces including apparatus dead space-its significance, measurements
	<i>Lung mechanics of breathing</i> <ul style="list-style-type: none"> • Relationship of chest the wall and diaphragm structure to respiratory mechanics • Lung ventilation: minute volume, rate, inspiratory and expiratory process • Pressure volume loop, flow and work breathing 	<ul style="list-style-type: none"> • Physics of gas flow and the relationship between resistant and flow • Factors affecting airway resistance and measurement of airway resistant

NO.	TOPICS	
	<ul style="list-style-type: none"> • Compliance: types, static compliance, dynamic compliance, factors affecting and clinical significance, measurements • The concept of time constant and its relation to fast & slow alveoli • Pressure volume relation of the lung, chest wall during controlled ventilation and spontaneous breathing • The significance of the vertical gradient of the pleural pressure and their values 	<ul style="list-style-type: none"> • Closing capacity, closing volume, residual volume. Their measurement and clinical significance • Surfactant: Composition, properties, effect, alteration, and clinical significance • Work of breathing and its component • Lung mechanics in common disease states
	<p><i>Lung Volumes</i></p> <ul style="list-style-type: none"> • Lung volumes and capacities: measurement of normal values • Factors influencing lung volumes and capacities • Alveolar ventilation: Bohr equation 	<ul style="list-style-type: none"> • Composition of inspired gas, alveolar gas, and expired gas • Functional residual capacity: functions, measurement
	<p><i>Diffusive Transfer of Respiratory Gases</i></p> <ul style="list-style-type: none"> • Oxygen cascade • Capillary gas exchange of O₂ and CO₂ • Alveolar gas equation • Definition of diffusion capacity. Factors affecting and measurement 	<ul style="list-style-type: none"> • Perfusion-limited and diffusion-limited transfer of gas - Fick's law of gas diffusion
	<p><i>Ventilation / Perfusion relationships</i></p> <ul style="list-style-type: none"> • Distribution of ventilation: Stratification & Non-stratification • Closing volume and capacity: Definition, factors affecting, measurement and clinical significance • Effect of time constant on gas distribution, flow, and mixing in the pre-terminal and terminal bronchioles. • Hypoxia: classification and causes • (A-a) O₂ different. Factors affecting, significant & clinical applications • Physics of gas flow: solution & diffusion 	<ul style="list-style-type: none"> • Ventilation/perfusion ratios: interpretation of normal, high, and low V/Q ratio, alveolar dead space, shunt equation (Q_s/Q_t), venous admixture. Effects of posture, two lung anaesthesia, one lung ventilation, ages, respiratory and circulatory changes • Sources and effects of turbulence: Significance & measurement
	<p><i>Gas transport in blood</i></p> <ul style="list-style-type: none"> • Oxygen carriage and transport: Body stores of oxygen, Oxy-haemoglobin dissociation curve, Bohr effect, 2, 3-disphosphoglycerate (2,3-DPG), Oxygen delivery to the tissue and oxygen cascade, hypoxia, and types • Blood tissue gas exchange 	<ul style="list-style-type: none"> • Carbon dioxide carriage and transport. Body stores of carbon dioxide: Carboxy-Haemoglobin dissociation curve, Haldane effect, hypercarbia, and its physiological effects • Haemoglobin: globin, heme, and amino acid structure, types and significance, buffer, and effect of blood storage
	<p><i>Control of respiration</i></p> <ul style="list-style-type: none"> • Organization of respiratory control mechanism • Central and peripheral chemoreceptors • Chemical, reflexes, and somatic influences • Minute ventilation response to exercise • Minute ventilation changes with altitude 	<ul style="list-style-type: none"> • Minute ventilation changes with pregnancy • Effects of general anaesthesia on ventilator control • Respiratory changes at high and low barometric pressures: acute, chronic & adaption mechanism

NO.	TOPICS	
	<p><i>Pulmonary circulation</i></p> <ul style="list-style-type: none"> • Anatomy of the pulmonary vascular system • Blood distribution through the lungs • Pulmonary vascular resistance • Factors affecting the pulmonary blood flow • Hypoxic pulmonary vasoconstriction 	<ul style="list-style-type: none"> • Effect of changes in pulmonary circulation on gas uptake and elimination • Pulmonary interstitial space and lymphatic function • Anaesthetic drugs and pulmonary blood flow
	<p><i>Applied respiratory physiology</i> (Candidates should be able to apply their knowledge in basic respiratory physiology into clinical practice)</p> <ul style="list-style-type: none"> • Clinical significance and measurement of pulmonary circulation: anatomical–shunt, physiological shunt, venous admixture effect, V/Q mismatch, types of dead space and their physiological adverse effects • Effect of hypoxaemia, hypo- and hypercapnia and CO poisoning • Definition of humidity and the importance of humidification • Importance of cough reflex • Effect of change of posture, pregnancy, and ageing under anaesthesia on ventilatory function • Difference in respiratory system of neonate and adult • Altered lung functions in common pulmonary diseases • Physiological effects of IPPV. Roles of CPAP, BiPAP and PEEP 	<ul style="list-style-type: none"> • Artificial lung ventilation, modes of ventilation, high frequency ventilation • Principles and techniques of humidification and nebulization • Respiratory changes during: Exercise, old age, general anaesthesia, posture, disease processes • Hyperoxia, hypoxia and asphyxia: types, effects, hyperbaric chamber, oximetry • Hypercapnia/carbia, clinical conditions, causes and capnography • High altitude sickness and decompression sickness (Caisson's disease) • Respiratory failure: definition, criteria, causes, pathophysiology & management • Lung functions: gas flow, ventilation/perfusion, diffusion, compliance, resistance
3.	CARDIOVASCULAR SYSTEM	
	<ul style="list-style-type: none"> • Properties of cardiac muscle, nodal and conductive tissue • Physiology and autonomic control of cardiac contraction • Contractility and Frank-Starling's law of the heart • Venous return/cardiac output curves/Guyton curve/Sagawa curve • Pressure-volume loop of LV in various conditions: hypovolaemia, hypervolemia, increased afterload, or preload 	<ul style="list-style-type: none"> • Definition of chronotropy and inotropy and factors affecting • Electrical and mechanical action of the heart <ul style="list-style-type: none"> - Cardiac cycle - Synchronization of pressure - Coronary circulation, heart sound, ECG, and echocardiogram • Physiology of conducting system and abnormalities
	<p><i>Vascular Network</i></p> <ul style="list-style-type: none"> • Arterial tree and venous systems • Capillary circulation, Starling's forces of the microcirculation • Arrangement of the vascular bed • Lymphatic system and its function 	<ul style="list-style-type: none"> • Peripheral A-V shunts • Pre and post capillary control and factors affecting • Blood rheology, viscosity and rheologic factors
	<ul style="list-style-type: none"> • Fluid exchange in tissue and control of blood volume: Changes with common circulatory derangement • Cardiovascular Function Measurement: <ul style="list-style-type: none"> • Isometric and isotonic contraction, Factors modifying dp/dt 	<ul style="list-style-type: none"> • Preload and afterload effects • Ionic disturbances • Blood flow and blood pressure and factors affecting • Cardiac output and factors affecting the cardiac cycle

NO.	TOPICS	
	<ul style="list-style-type: none"> • Foresters' prediction Quadrants 	
	<p><i>Central and Autonomic Nervous Control of Circulation</i></p> <ul style="list-style-type: none"> • Vasomotor centre and tone • Cardiac excitatory and inhibitory centres • Baroreceptor (carotid sinus, aortic sinus) and chemoreceptor (carotid bodies, aortic bodies) reflexes • Effects of sympathetic and parasympathetic overactivity and underactivity • Cardiovascular responses to exercise • Cardiovascular changes in pregnancy • Cardiovascular effects of general anaesthesia and central neural blockade 	<p><i>Physiologic anatomy of regional circulation, arrangement of specific vascular beds</i></p> <ul style="list-style-type: none"> • Cerebral, coronary, renal, pulmonary, hepatic, and portal, skin, muscle, and splanchnic circulation • Organ-autoregulation, factors controlling/ modifying/regulating • Clinical significance and applications
	<p><i>Circulatory effects of.</i></p> <ul style="list-style-type: none"> • Posture • Age • Exercise • Altitude • artificial ventilation • Valsalva manoeuvre • Muller's manoeuvre 	<p><i>Special Circulation</i></p> <ul style="list-style-type: none"> • Autoregulation and demand in organ blood flow • Coronary circulation • Pulmonary circulation • Cerebral circulation • Hepatic and splanchnic circulation • Renal circulation • Skeletal circulation • Utero-placental circulation • Foetal circulation
	<p><i>Applied Cardiovascular System Physiology</i> (Candidates are expected to know cardiovascular responses to physiological changes in healthy person and diseases states)</p> <ul style="list-style-type: none"> • Change in posture • Blood loss and hypovolemia • Pathophysiology of shock due to blood loss, sepsis, anaphylactic, and cardiogenic. 	<ul style="list-style-type: none"> • CV changes in pregnancy, exercise, cardiac failure, IPPV, general anaesthesia, regional anaesthesia, PEEP, Valsalva manoeuvre and ageing • Measurement of cardiovascular functions: ECG, echocardiogram, NIBP, IBP, method of assessment of myocardial function, cardiac output (PA catheter, PiCCO, Flow tract/Vigilio)
4.	CENTRAL NERVOUS SYSTEM	
	<ul style="list-style-type: none"> • Sensory perception • Resting membrane potentials & conduction of impulse <ul style="list-style-type: none"> ✓ Action potentials ✓ Endplate potentials ✓ Impulse propagation ✓ Velocity and factors affecting impulse ✓ Energy supply and utilization in nervous tissue 	<ul style="list-style-type: none"> • Synaptic: anatomy, physiology, and functions • Senses: receptors, nociception & special senses • Sensory and motor pathways neurological reflexes
	<ul style="list-style-type: none"> • CSF: volume, formation, composition, flow, and factors modifying • Intracranial and intraocular pressure • Blood-brain barrier • Spinal cord: anatomy, blood supply & effects of transaction • Hypothalamus, thalamus, and temperature control 	<ul style="list-style-type: none"> • Reticular formation: ECG, sleep and awake • Sleep, hypothalamus, and thalamus • ANS and emotion • Cerebral state monitoring e.g., EEG, BIS, SSEP, BAEP, MEP, sleep and awakening
5.	RENAL SYSTEM	

NO.	TOPICS	
	<ul style="list-style-type: none"> • Functional anatomy of the kidneys and renal blood flow (measurement) • Glomerular filtration (measurement) and tubular functions • Counter current mechanisms • Regulation of renal function • Endocrine functions of the kidneys • Maintenance of acid-base, fluid, and electrolyte balance • Maintenance of osmolality • Handling of glucose, nitrogenous products, and drugs 	<ul style="list-style-type: none"> • Measurement of glomerular filtration rate and renal blood flow • Renal dysfunction: physiological effects and clinical assessments • Responses to hypovolemia • Renal function test • Urine analysis • Changes in the disorder state • Effects of anaesthetic drugs and general anaesthesia on renal functions • Drugs renal toxicity
6.	MUSCULOSKELETAL SYSTEM	
	<ul style="list-style-type: none"> • Principles of the physiology of muscle, joints, and bone • Muscle types: types of skeletal muscle fibres • Excitation-contraction coupling • Neuromuscular junction: anatomy, physiology, and transmission • Motor end plate unit 	<ul style="list-style-type: none"> • Muscle tone, muscle spindle, reflexes • Monosynaptic stretch reflex • Single twitch, tetanus and Treppe effect • Relationship between muscle length and tension (isotonic-isometric contraction) • Calcium metabolism • Control of posture and movement
7.	GASTRO-INTESTINAL/ LIVER SYSTEM	
	<p><i>Gastrointestinal tract</i></p> <ul style="list-style-type: none"> • Saliva: physiological function • Regulation, components, and volume of GIT tract fluids e.g., saliva, gastric fluid, bile and intestinal fluids, effects of loss, replacement, and treatments • Physiology of swallowing and vomiting • GI motility: factors affecting and control • Fat, protein and carbohydrate digestion and absorption • Absorption mechanism 	<p><i>Liver</i></p> <ul style="list-style-type: none"> • Functional anatomy and blood supply: hepatic artery, hepatic vein, portal system • Regulation of hepatic circulation • Functions of the liver • Protective function and glycogen mobilization • Assessment of liver function tests
8.	ACID-BASE BALANCE PHYSIOLOGY	
	<ul style="list-style-type: none"> • Definition of ABB • Henderson-Hasselbalch equation • Methods of assessment of ABB • Astrup method • Blood buffer mechanisms 	<ul style="list-style-type: none"> • Respiratory system as a buffer • Renal regulation • Changes in disordered states • Principles of assessment of ABB and management
9.	BODY FLUIDS & ELECTROLYTES	
	<ul style="list-style-type: none"> • Body fluids distribution and measurement • Distribution and composition of electrolytes • Disturbances of body fluid and electrolytes • Lymph: composition and functions • Definition and determinants of osmotic and oncotic pressure 	<ul style="list-style-type: none"> • The role of osmotic and oncotic pressure • Endocrine control of body fluids • Osmolality: measurement and regulation • Crystalloid versus colloid IV fluids • Changes in body fluid and electrolytes in severe exercise
10.	HAEMATOLOGICAL SYSTEM	
	<ul style="list-style-type: none"> • Blood and plasma constituents: e.g., RBC, Hb, proteins, platelets, white blood cells, plasma cells, antibodies • Clotting mechanism and clot-lysis (fibrinolysis) • RBCs: haemoglobin and its variant 	<ul style="list-style-type: none"> • Physiological changes in anaemia • Blood grouping and cross match • Blood transfusion, techniques, and hazards • Blood substitutes

NO.	TOPICS	
	<ul style="list-style-type: none"> • Hb metabolism • Haemostasis, coagulation, and fibrinolysis 	<ul style="list-style-type: none"> • Changes in stored blood, massive blood transfusion & blood products
11.	IMMUNOLOGY	
	<ul style="list-style-type: none"> • Types of cells producing antibodies • Type of immune systems, antibodies, and their functions • Immune function in anaesthesia and critical illness 	<ul style="list-style-type: none"> • Hypersensitivity reactions: immunological basis, pathophysiology, and management • Complement system and cytokines • Active and passive immunity • Tissue typing and tissue & organ transplantation
12.	ENDOCRINE SYSTEM	
	<ul style="list-style-type: none"> • Mechanisms of hormonal control: feedback mechanisms, effect on the membrane and intracellular receptors • Hypothalamic and pituitary gland • Adreno-cortical hormones • Adrenal medullary hormones • Pancreatic hormones 	<ul style="list-style-type: none"> • Thyroid, parathyroid hormones and calcium homeostasis • Renin-angiotensin system • Prostaglandins and autocooids • Natriuretic peptides • Regulation of blood sugar • Iodine metabolism • Assessment of endocrine function
13.	FOETAL & NEONATAL PHYSIOLOGY	
	<p><i>Foetal physiology:</i></p> <ul style="list-style-type: none"> • Placental gaseous exchange • Circulatory changes during delivery • Foetal haemoglobin • Acid-base balance 	<p><i>Neonatal physiology:</i></p> <ul style="list-style-type: none"> • Respiratory changes at birth • Circulation changes at birth • Temperature control • Effects of asphyxia, anaemia, and physiology disorder in neonates
14.	MATERNAL/ PREGNANCY	
	<ul style="list-style-type: none"> • Physiological changes, cause, and consequences e.g., CV changes, RS changes, renal, endocrine, and haematological changes • Supine position in full-term pregnancy • Maternofoetal, foetal, and neonatal circulation • Functions of the placenta: placental transfer, double Bohr, and Haldane effects 	<ul style="list-style-type: none"> • Foetus: respiratory and cardiovascular changes at birth • Neonates versus adults: temperature regulation, body function and control and composition of body fluids
15.	NUTRITION AND METABOLISM	
	<ul style="list-style-type: none"> • Nutrients: carbohydrate, fat, protein, vitamins, and trace elements • Metabolic pathways, energy production and enzymes • Aerobic (Krebs/citric acid cycle) and anaerobic metabolism • Enteral and parenteral nutrition • Sources of energy (Kcal) • Consequences of anaerobic metabolism 	<ul style="list-style-type: none"> • BMR and its measurement • Hormonal control of metabolism: regulation of plasma glucose and response to trauma • Physiological changes in starvation, obesity, exercise, sepsis, burn and trauma • Body temperature and its regulation
16.	THERMOREGULATION	
	<ul style="list-style-type: none"> • Significance of temperature control • Mechanisms of heat production, heat loss and heat gain in adult and paediatric patients • Conserving and generating heat in a cold environment and the anaesthetic effects on the processes 	<ul style="list-style-type: none"> • TNZ zone and energy requirements to maintain normal body temperature in paediatric patients • Regulation of body temperature: the difference between adults and neonates

NO.	TOPICS	
	<ul style="list-style-type: none"> Heat loss in hot/cold environment and heat loss during GA and its effects 	<ul style="list-style-type: none"> Measurement of core body temperature and humidity
17.	GERIATRIC PHYSIOLOGY	
	<ul style="list-style-type: none"> Physiological changes (CVS, RS, CNS, renal, haematology, endocrine, musculoskeletal etc.) in the elderly patients 	<ul style="list-style-type: none"> Pharmacokinetic and drugs effects on CVS, RS, CNS, renal, musculoskeletal and others

CLINICAL MEASUREMENTS (Phase 1 / Year 1)

Candidate should understand the basic principles of measurements used in clinical practice for the assessment and evaluation of:

	TOPICS	
1.	<ul style="list-style-type: none"> SI units & other systems of units relevant to anaesthesia Mathematical calculations: e.g., exponential function, differentiation, and integration 	<ul style="list-style-type: none"> Conversion of different units of pressure measurement (mmHg to pKa)
2.	<ul style="list-style-type: none"> Principles, laws, and analysis related to liquids/gases/vapours clinical measurements <ul style="list-style-type: none"> Laminar vs turbulent flow ✓ Surface tension, viscosity ✓ Fick's principle ✓ Entrainment ratio Oxygen measurement: spectrophotometric, fuel cell, paramagnetic analyser 	<ul style="list-style-type: none"> Carbon dioxide measurement: infrared analyser, Severinghaus electrode Gas and vapour analysis: gas chromatography, mass spectrometer, Raman scattering Acid-base analysis
3.	Non-invasive monitoring systems in OT and ICU	
	Principles, components, mechanism of action, safety features of: <ul style="list-style-type: none"> ECG Arterial blood pressure Pulse oximetry End-tidal carbon dioxide analysers (side stream vs mainstream) 	<ul style="list-style-type: none"> Oxygen concentration analyser Pneumotachograph Peripheral nerve stimulator (TOF) Bispectral index (BIS) analysis
4.	Invasive monitoring systems in OT and ICU	
	Principles, components, mechanism of action, safety features of: <ul style="list-style-type: none"> Arterial blood pressure Central venous pressure/catheter 	<ul style="list-style-type: none"> Pulmonary artery pressure/catheter Temperature probes

PHARMACOLOGY (Phase 1/ Year 1)

Candidates are expected to have a detailed knowledge of the pharmacology of drugs used in anaesthetic practice and ICU. Emphasis is more on the pharmacokinetics of drugs i.e., route of administration, uptake, distribution, and clearance from the body. Detailed knowledge of the drug pharmacodynamics and side effects is required.

NO.	TOPICS	
1.	APPLIED CHEMISTRY & MODES OF DRUG ACTION	
	<ul style="list-style-type: none"> • Types of molecular bonds • Laws of diffusion and diffusion of molecules through membranes • Solubility and partition coefficients • Concept of ionization of drugs, free form, bind form, ionized/non-ionized forms, drug isomerism and protein binding • Mode of action of drugs: receptor theories, types of drug action (signal transduction, cell membrane/receptors/ion channel to intracellular molecular targets, second messengers), mechanism of drug interactions 	<ul style="list-style-type: none"> • Receptors: drug-receptor interaction, function & regulation, agonist, antagonist, partial agonist, efficacy, potency, tolerance, tachyphylaxis, addiction, dependence & idiosyncrasy, metabolic pathway, enzymes, drug/enzyme interaction, Michaelis-Menten equation • Ion channels: types of ion channels, relation to receptor and gating mechanism. • Pharmaceutical preparation of drugs
2.	PHARMACOKINETICS	
	<ul style="list-style-type: none"> • Uptake (routes of administration), distribution and elimination. • Concept of $T_{1/2\alpha}$ & $T_{1/2\beta}$ and body compartmental model. • Drug transport • Lipid solubility: oil/gas solubility constant • Blood/gas coefficient • pKa and ionization and clinical applications 	<ul style="list-style-type: none"> • Regional uptake • Drug interaction and enzyme induction • Drug metabolism (phase 1 & phase 2), detoxification and elimination • Maternal-foetal drug distribution, interaction, metabolism, and elimination
3.	PHARMACODYNAMICS	
	<ul style="list-style-type: none"> • Mechanisms of drug action • Pharmacological effect of drugs • Clinical uses • Side effects 	<ul style="list-style-type: none"> • Pharmacogenetics (familial variation in drug responses) • Adverse reactions to drugs (hypersensitivity, allergy, anaphylaxis anaphylactoid reactions)
4.	INTRAVENOUS ANAESTHETIC AGENTS	
	<ul style="list-style-type: none"> • Properties of an ideal intravenous anaesthetic agent • Distribution, elimination, and excretion to include the concept of $T_{1/2\alpha}$ & $T_{1/2\beta}$ and Clearance • pH, effects, storage • Thiopentone • Methohexitone • Propanidid 	<ul style="list-style-type: none"> • Ketamine • Benzodiazepine e.g., nitrazepam, diazepam, midazolam • Althesin • Etomidate • Propofol • Drug interactions
5.	INHALATIONAL ANAESTHETIC AGENTS	
	<ul style="list-style-type: none"> • Ideal inhalational anaesthetic agent • Pharmaceutical & Pharmacokinetics: administration, distribution, metabolism, and elimination 	<ul style="list-style-type: none"> • Enflurane • Isoflurane • Desflurane • Sevoflurane • Xenon

NO.	TOPICS	
	<ul style="list-style-type: none"> • Physical properties/ potencies: MAC, MAC awake, MAC Bar • N₂O • Ether • Halothane • Methoxyflurane 	<ul style="list-style-type: none"> • Gas pollution and scavenging system • Metabolism • Renal and liver toxicity • Interaction under GA
6.	NEUROMUSCULAR BLOCKING AGENTS AND ANTI-CHOLINESTERASE	
	<ul style="list-style-type: none"> • Classification of NMBA • Normal mechanism of muscle contraction • Depolarizers e.g., rocuronium, atracurium • Non-depolarizers: suxamethonium • Pharmacokinetics and pharmacodynamics of each NMBA • Complications, problems, drugs interactions • Factors affecting and modifying the response • Concept of recurarization 	<ul style="list-style-type: none"> • Depolarizer: dual block/phase II block • PNS: supramaximal stimulus, current, voltage, TOF count, TOF ratio • Dantrolene • Malignant hyperthermia • Cholinesterase variants: atypical pseudocholinesterase, genetic coding, silent gene, DN, C5 variant • Organophosphate poisoning
7.	LOCAL ANAESTHETIC AGENTS	
	<ul style="list-style-type: none"> • Classification of LA • Pharmacology of LA agents • Clinical Usage • Side effects 	<ul style="list-style-type: none"> • Prolongation of action • LA interaction • Systemic toxicity of LA, blood level, CVS/CNS ratio & treatment
8.	OPIOIDS ANALGESICS	
	<ul style="list-style-type: none"> • Classification of opioids • Pharmacology of commonly used opioids e.g., morphine, fentanyl, remifentanyl • Clinical indications and delivery dose e.g., TIVA for remifentanyl 	<ul style="list-style-type: none"> • Side effects • Drug interaction, problems, and antagonist
9.	NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDs)	
	<ul style="list-style-type: none"> • Prostaglandins • Definition 	<ul style="list-style-type: none"> • Pharmacodynamics, systematic effects, and side effects • Neuroleptic-analgesia combination
10.	DRUGS THAT AFFECT THE CARDIOVASCULAR SYSTEM	
	<p><i>Sympathomimetics</i></p> <ul style="list-style-type: none"> • SAR, adrenergic receptors, and compounds • Antagonists and blockers • Effects of MAOI inhibitors <p><i>Anti-hypertensive drugs</i></p> <ul style="list-style-type: none"> • Classification • Pharmacology of common drugs: <ul style="list-style-type: none"> - α-blocker: prazosin (minipress), PBZ, phentolamine - β-blockers: propranolol, metoprolol, labetalol etc. - Ganglionic blockers: - Smooth muscle vasodilator: Mg₂SO₄, hydralazine - Arteriolar vasodilator: SNP - Venodilator: GTN - Calcium channel blockers: amlodipine, felodipine, diltiazem - ARB: losartan, valsartan, irbesartan - ACE inhibitors: captopril, enalapril, benazepril 	<p><i>Sympatholytic drugs</i></p> <ul style="list-style-type: none"> • Acetylcholine-SAR and clinical effects • Cholinergic and anti-cholinergic compounds • Organophosphate poisoning <p><i>Cardiac glycosides:</i></p> <ul style="list-style-type: none"> • Digitalis e.g., digoxin • Pharmacokinetics and pharmacodynamics • Clinical uses • Modifying factors • Toxicity and management

NO.	TOPICS	
	<ul style="list-style-type: none"> - Anaesthetic volatile agents: sevoflurane, desflurane 	
11.	DRUGS THAT AFFECT THE RESPIRATORY SYSTEM	
	<ul style="list-style-type: none"> • Bronchodilators: salbutamol, theophylline, anticholinergics (Atrovent) 	<ul style="list-style-type: none"> • Analeptic drugs: doxapram
12.	DRUGS THAT AFFECT THE CENTRAL NERVOUS SYSTEM	
	<ul style="list-style-type: none"> • Sedative: definition of sedation, narcosis, addiction, habituation • Classification • Barbiturates e.g., thiopentone, methohexitone • Non-barbiturate drugs e.g., ketamine, althesin, etomidate 	<ul style="list-style-type: none"> • Tranquilizers e.g., midazolam, diazepam, lorazepam • Pre-medication, principles, and problems • Compare and contrast of drugs used for premedication
13.	DRUGS THAT AFFECT RENAL SYSTEM	
	<ul style="list-style-type: none"> • Diuretics: frusemide, chlorothiazides, spironolactone • Mode of action, usage, and drug interaction 	<ul style="list-style-type: none"> • Renal toxicity drugs
14.	DRUGS THAT AFFECT HAEMATOLOGICAL SYSTEM	
	<ul style="list-style-type: none"> • Anticoagulants (heparin, warfarin, fondaparinux, enoxaparin, dabigatran) • Antiplatelet (clopidogrel, ticlopidine) • Fibrinolytic agents (streptokinase, urokinase) 	<ul style="list-style-type: none"> • Anti-fibrinolytic agents (tranexamic acid, aprotinin, epsilon-aminocaproic acid) • Coumarin and indanedione
15.	DRUGS THAT AFFECT GASTROINTESTINAL TRACT	DRUGS THAT AFFECT ENDOCRINE SYSTEM
	<ul style="list-style-type: none"> • Drugs that gastrointestinal tract system • Drugs that reduce gastric secretion 	<ul style="list-style-type: none"> • Insulin and anti-hypoglycaemia agents • Steroids • Thyroid and anti-thyroid drugs
16.	DRUGS THAT AFFECT UTERUS	ANTIBIOTICS & CHEMOTHERAPEUTIC DRUGS
	<ul style="list-style-type: none"> • Oxytocic drugs (oxytocin, Pitocin, ergometrine) • Usage, complication, and drug interactions • Tocolytic drugs 	<ul style="list-style-type: none"> • Antibiotics: indications, clinical effects, and side effects • Antimicrobial agents e.g., indications, clinical uses, and side effects
18.	HISTAMINE AND ANTIHISTAMINE	
	<ul style="list-style-type: none"> • Histamine • Antihistamine: H1 (promethazine, prochlorperazine, buclizine), H2 (cimetidine, ranitidine), H3, H4) 	<ul style="list-style-type: none"> • Side effects of anti-histidine drugs • Use in anaesthetic practice • Classification of anti-emetic and their side effects

PART 2 (Final)

The Part 2 (Final) Conjoint Board Examination covers all aspects of the theory and practice of anaesthesia and intensive care, medicine, surgery, clinical pathology, and anatomy as applied to the practice of anaesthesia. The examination in anatomy covers those aspects which are relevant to regional block, local block, and general anaesthesia techniques. Candidates should also study the theory and practice of intensive care, resuscitation and pain management.

CLINICAL ANEASTHESIOLOGY (Phase 2/Year 2 and 3)

NO.	TOPICS	
1.	Fundamentals in anaesthesia	
	<ul style="list-style-type: none"> • History of anaesthesia • Theories & stage of general anaesthesia 	<ul style="list-style-type: none"> • Medical assessment, pre-anaesthetic evaluation & premedication • Investigations & preoperative management
2.	Clinical anaesthesia & pharmacology of anaesthetic drugs	
	<ul style="list-style-type: none"> • IV anaesthesia • Inhalation anaesthesia technique • TIVA / TCI • Monitored anaesthesia care 	<ul style="list-style-type: none"> • Local anaesthetics • Preparation for anaesthesia-central & regional block
3.	Airway problem & management	
	<ul style="list-style-type: none"> • Applied anatomy: Upper / lower respiratory airways • Techniques of intubation-endotracheal, nasotracheal, endobronchial • Special considerations: video laryngoscope, awake fiberoptic intubation 	<ul style="list-style-type: none"> • Airway emergencies & management: <ul style="list-style-type: none"> - Cannot ventilate - Cannot intubate - Cannot intubate and cannot ventilate
4.	Specialty anaesthesiology	
	<p>Anaesthesia for cardiac surgery</p> <ul style="list-style-type: none"> • General: History & clinical examination • Relevant investigation & imaging • Haemodynamic control (principles, CVS haemostasis, induced hypotension / hypothermia) • Monitoring in cardiac surgery • Anaesthesia in Cardiac Surgery <ul style="list-style-type: none"> - Heart valve disease - Coronary artery bypass grafting (CABG) - Minimally invasive cardiac surgery • Special considerations. <ul style="list-style-type: none"> - Cardiopulmonary bypass (CPB) - Intra-aortic balloon pump (IABP) - Cardiac pacing - Extra corporeal circulation (ECMO) - Patient blood management 	<p>Anaesthesia in thoracic surgery</p> <ul style="list-style-type: none"> • Pre-operative assessment • Airway management (one lung ventilation, double lumen endotracheal tube, bronchial blocker) • Pathophysiology of thoracic trauma • Ventilation in thoracic surgery • Anaesthesia in: <ul style="list-style-type: none"> - Minimally invasive thoracic surgery - Thoracic surgery - Thoracic emergencies • Pain management in thoracic surgery
	Anaesthesia in vascular surgery	

<ul style="list-style-type: none"> • Anaesthesia for aorta (ascending, arch, descending, abdominal) and carotid artery • Anaesthesia for interventional radiology procedure 	<ul style="list-style-type: none"> • Pathophysiology of aortic cross-clamp/ aortic dissection • Hypothermic circulatory arrest
<p>Anaesthesia and analgesia in obstetrics and gynaecology</p> <ul style="list-style-type: none"> • Physiology <ul style="list-style-type: none"> - Maternal and placental physiology - Process of labour & delivery - Post-partum period • Pharmacology <ul style="list-style-type: none"> - Obstetric & post-partum pharmacology - Placental drug transfer • Anatomy changes in obstetrics • General topics: Pre-anaesthesia assessment of obstetric patient, identifying of high-risk patient 	<ul style="list-style-type: none"> • Anaesthesia for elective obstetric procedures, non-obstetrics surgery, Caesarean section, pain management in obstetrics • Anaesthesia in obstetrics emergencies • Foetal considerations <ul style="list-style-type: none"> - Foetal teratogenicity - Antepartum & intrapartum foetal compromise - Foetal death in utero; pathophysiology
<p>Anaesthesia in orthopaedics</p> <ul style="list-style-type: none"> • Anaesthetic assessment and techniques in common orthopaedic and spine surgery (prone) • Anaesthetic implications in spine surgery • Special considerations: pathophysiology of tourniquet use, fat embolism, spinal cord monitoring, bone cement implantation syndrome, polytrauma 	<p>Regional Anaesthesia (RA)</p> <ul style="list-style-type: none"> • Applied anatomy: Vertebral column and related structure, cervical / brachial / lumbar plexus, and nerves of the lower extremities • Advantages / disadvantages of RA • Indications / contraindications of RA (anticoagulation and RA) • Principles of ultrasound guided RA • Complications and management of RA
<p>Paediatric & Neonatal Anaesthesia</p> <ul style="list-style-type: none"> • General Topics <ul style="list-style-type: none"> - Comparison paediatric/ neonate & adults' anatomy & physiology especially RS, CVS etc. - Pharmacodynamics & pharmacokinetics in paediatric/ neonate • Anaesthesia in: <ul style="list-style-type: none"> - Elective neonatal/ paediatric surgery - Surgical emergencies: tracheo-oesophageal fistula, gastroschisis, omphalocele, necrotizing enterocolitis, pyloric stenosis, burns - Management of long surgery e.g., laparoscopic procedures - Preterm babies - Syndromic babies 	<ul style="list-style-type: none"> • Paediatric / neonate issues: <ul style="list-style-type: none"> - Fluid management / transfusion - Intraoperative monitoring - Pain management in paediatric - Caudal epidural - Intubation - Resuscitation - Thermoregulation
<p>Anaesthesia for emergency surgery</p> <ul style="list-style-type: none"> • General: pre-operative assessment/ stabilization • Anaesthetic management, management of circulation, shock, intra-operative fluid therapy 	<p>Anaesthesia for day care surgery</p> <ul style="list-style-type: none"> • Patient selection and other considerations • Anaesthetic techniques • Criteria for discharge and post-discharge instructions
<p>Anaesthesia for minimally invasive surgery</p>	<p>Anaesthesia for dental / maxillofacial surgery</p>

	<ul style="list-style-type: none"> • Pre-operative assessment and anaesthetic techniques • Examples of minimally invasive procedures (including robotic surgery) • Effects of pneumoperitoneum, carbon dioxide insufflation, extraperitoneal gas insufflation, positioning, trauma to intra-abdominal structures 	<ul style="list-style-type: none"> • Anaesthetic implications in 'shared airway' • Perioperative management in maxillofacial trauma, prolonged surgery
	<p>Anaesthesia for neurosurgery and neuroradiology-diagnostic procedure</p> <ul style="list-style-type: none"> • Anaesthetic implications in head injury • Anaesthetic management in craniotomy, posterior fossa surgery, pituitary surgery, cerebrovascular surgery • Anaesthetic considerations in interventional neuroradiology procedure 	
6.	<p>Others</p> <p>Anaesthesia and obesity</p> <ul style="list-style-type: none"> • Anaesthetic implications • Pre-operative assessment and anaesthetic techniques • Obstructive sleep apnoea (OSA) and its implications 	<p>Anaesthesia and renal disease</p> <ul style="list-style-type: none"> • Anaesthetic implications • Pre-operative assessment and anaesthetic techniques • Renal protection strategy • Post-operative considerations
	<p>Anaesthesia and respiratory disease</p> <ul style="list-style-type: none"> • Pulmonary risk factors, smoking and anaesthesia • Anaesthetic management in asthma, COAD, restrictive lung disease • Management of intraoperative bronchospasm and respiratory tract infection 	<p>Anaesthesia with endocrine disease</p> <ul style="list-style-type: none"> • Anaesthetic implications and management in; <ul style="list-style-type: none"> - Diabetes mellitus - Thyroid surgery - Parathyroid surgery - Pheochromocytoma - Pituitary gland dysfunction - Adrenal gland disease
	<p>Management of patient in recovery room (RR) or post-anaesthesia care unit (PACU)</p> <ul style="list-style-type: none"> • Requirements of RR / PACU (location, design, equipment, personnel) • Anticipated problems and its management • Discharge criteria from RR / PACU 	

INTENSIVE CARE (Phase 2/Year 2 and 3)

NO.	TOPICS	
1.	<p>Paediatrics</p> <ul style="list-style-type: none"> • Common airway problem and management (croup, epiglottitis, tracheitis) • Common surgically related conditions: sepsis, septic shock, nutritional support 	<ul style="list-style-type: none"> • Special considerations; <ul style="list-style-type: none"> - Mechanical ventilation - Intra/interhospital transfer
	<p>Cardiovascular system</p> <ul style="list-style-type: none"> • Assessment of cardiac failure (acute and chronic) 	<ul style="list-style-type: none"> • Special considerations;

	<ul style="list-style-type: none"> Assessment of different types of shock (cardiogenic, hypovolaemic, anaphylactic, septic, neurogenic) Management of shock, cardiac failure Other cardiovascular diseases and management: ischaemic heart disease, endocarditis, cardiac arrhythmias, hypertensive crisis, cardiomyopathies 	<ul style="list-style-type: none"> Invasive monitoring (CVP, PA catheter, PiCCO, Flow-tract/Vigilio) Scoring system in ICU Ultrasound in critical care
3.	Respiratory system	
	<ul style="list-style-type: none"> Assessment and management of respiratory failure (acute and chronic) Other respiratory disorders and management: COAD, bronchial asthma, ARDS, lung tumours, pneumonias, mediastinal mass 	<ul style="list-style-type: none"> Specific skills; <ul style="list-style-type: none"> Bronchoscopy & bronchial lavage Percutaneous tracheostomy Chest tube insertion/ removal
4.	Mechanical ventilation	
	<ul style="list-style-type: none"> Applied anatomy of lungs, diaphragm, and phrenic nerves Ventilator parameters Principles of different modes of ventilation (including non-invasive ventilation) 	<ul style="list-style-type: none"> Ventilatory strategies for ARDS, asthma, COAD, head injury, neuromuscular diseases Weaning from ventilation
5.	Renal system	
	<ul style="list-style-type: none"> Assessment and management of acute and chronic renal failure Prevention of acute kidney injury (AKI) 	<ul style="list-style-type: none"> Special considerations: <ul style="list-style-type: none"> Fluid and electrolyte disturbance Types of renal replacement therapy (RRT)
6.	Haematology system	
	<ul style="list-style-type: none"> Pathophysiology, assessment and management in haemostasis, thrombosis, anaemia, polycythaemia, thrombocytopenia, disseminated intra-vascular coagulopathy (DICC) 	<ul style="list-style-type: none"> Special considerations; <ul style="list-style-type: none"> Use of blood & substitutes & principles of IV infusions Massive transfusion protocol Haematological malignancies and immunosuppression
7.	Poisoning and drug overdose	
	<ul style="list-style-type: none"> Assessment of poisoning and drug overdose: organophosphate, paraquat, paracetamol, opioid, benzodiazepine. 	<ul style="list-style-type: none"> Management of poisoning and drug overdose
8.	Infection and Sepsis	
	<ul style="list-style-type: none"> Definition / criteria, assessment, and management for systemic inflammatory response (SIRS), sepsis, severe sepsis, septic shock 	<ul style="list-style-type: none"> Special considerations; <ul style="list-style-type: none"> Multi-organ failure Immunocompromised patients Universal precautions

PHYSICS & EQUIPMENTS (Phase 2, Year 2 and 3)

NO.	TOPICS	
1.	Anaesthetic machine	
	<ul style="list-style-type: none"> Anatomy of anaesthetic machine Pressure gauge, pressure regulator, flowmeters 	<ul style="list-style-type: none"> Anaesthetic breathing system & ventilators Scavenging system
2.	Medical gas supply	
	<ul style="list-style-type: none"> Gas laws Compressed gas, cylinder gas, pipeline, concentrators 	<ul style="list-style-type: none"> Others: Vacuum insulated evaporator (VIE), cylinder valves
3.	Vaporizers and anaesthetic gases	

	<ul style="list-style-type: none"> • Characteristics of ideal vaporizer • Mechanism of action and safety features 	<ul style="list-style-type: none"> • Vaporizer filling device
4.	Humidification system and filters	
	<ul style="list-style-type: none"> • Characteristics of ideal humidifier • Humidifiers: heat and moisture, hot water bath, nebulizers (components, mechanism of action, safety features) 	<ul style="list-style-type: none"> • Filters: bacterial/ viral, electrostatic, hydrophobic (components, mechanism of action, safety features)
5.	Ultrasonography and Doppler	
	<ul style="list-style-type: none"> • Basic principles of ultrasound • Physical properties • Display mode • Transducers 	<ul style="list-style-type: none"> • Image optimisation • Principles of Doppler (colour flow and spectral analysis)
6.	Intubation devices & airway adjuncts	
	<p>Components, mechanism of action, safety features of:</p> <ul style="list-style-type: none"> • Laryngoscope, video laryngoscope, fiberoptic intubating laryngoscope • Tube airway exchanger, bougie, Magill forceps 	<ul style="list-style-type: none"> • Endotracheal tubes, double lumen tubes, RAE, and others • Supraglottic airway devices
7.	Fires hazards and electrical safety in OT and ICU	
	<ul style="list-style-type: none"> • Principles of electricity, fire • Maintenance of equipment • Hazards of electrical shock, static electricity 	<p>Components, mechanism of action, safety features of:</p> <ul style="list-style-type: none"> • Diathermy • Laser
8.	Sterilization & cleaning equipment	
	<ul style="list-style-type: none"> • Definition of cleaning, sterilisation, and disinfection. • Types of sterilisations 	<ul style="list-style-type: none"> • Monitoring of sterilisation

MISCELLANEOUS (Phase 2, Year 2 and 3)

NO.	TOPICS
1.	Design of OT, recovery rooms and ICU
2.	<p>Basic knowledge of administration</p> <ul style="list-style-type: none"> • Setting up anaesthetic department • Staff management • Quality assurance/ medical audit • Interdepartmental relationship
3.	<p>Research methodology</p> <ul style="list-style-type: none"> • Project proposal & presentation • Ethical approval • Funding/financial support • Data collection • Statistical analysis • Writing-up manuscript • Submission of manuscript for publication

CLINICAL ANAESTHESIOLOGY (Phase 3/Year 4)

NO.	TOPICS
1.	<p>Specialty anaesthesiology</p> <p><i>Anaesthesia for ophthalmology surgery</i> <i>Anaesthesia for ORL surgery</i></p>

NO.	TOPICS							
	<ul style="list-style-type: none"> Anaesthetic implications in ophthalmic surgery Anaesthetic techniques in ophthalmic surgery Measures to reduce intraocular pressure, oculocardiac reflex, nitrous oxide usage, penetrating eye injury 	<ul style="list-style-type: none"> Anaesthetic implications in ORL surgery Perioperative assessment and anaesthetic management in ORL surgery Issues: <ul style="list-style-type: none"> Controlled hypotension Post-tonsillectomy bleed Usage of nitrous oxide in ear surgery Airway fires in laser airway surgery 						
	<p>Anaesthesia for urological surgery</p> <ul style="list-style-type: none"> Anaesthetic management in urological surgery <ul style="list-style-type: none"> Transurethral prostatectomy (TURP) Renal transplant Percutaneous nephrolithotripsy Kidney transplant Robotic surgery Issue: Transurethral prostatectomy (TURP) syndrome 							
.	<p>Others</p> <table border="1" data-bbox="296 891 1476 1832"> <tbody> <tr> <td data-bbox="296 891 906 1205"> <p>Anaesthesia with liver disease</p> <ul style="list-style-type: none"> Anaesthetic implications in patients with liver disease Pre-operative assessment/ stabilization Anaesthetic management in liver transplant </td> <td data-bbox="906 891 1476 1205"> <p>Anaesthesia at remote sites</p> <ul style="list-style-type: none"> Anaesthetic concerns in remote sites (equipment, patient, staff, procedure) Anaesthetic techniques Specific considerations: <ul style="list-style-type: none"> MRI suites Equipment checklist ECT - </td> </tr> <tr> <td data-bbox="296 1205 906 1529"> <p>Anaesthesia with neuromuscular disease</p> <ul style="list-style-type: none"> Applied anatomy of autonomic and peripheral nervous system. Anaesthetic concerns and peri-operative management in; <ul style="list-style-type: none"> Intracranial pathology (cerebral palsy, Parkinson) Spinal cord pathology (spinal cord injury, paraplegia, quadriplegia) </td> <td data-bbox="906 1205 1476 1529"> <ul style="list-style-type: none"> Motor neuron disease (lateral sclerosis) Peripheral neuropathy (Guillain-Barre, diabetic neuropathy) Neuromuscular junction lesion (Myasthenia Gravis, Eaton Lambert syndrome) Myopathy (dystrophia myotonica, muscular dystrophy) </td> </tr> <tr> <td data-bbox="296 1529 906 1832"> <p>Anaesthesia with connective tissue disease</p> <ul style="list-style-type: none"> Anaesthetic implications and peri-operative management in; <ul style="list-style-type: none"> Rheumatoid arthritis Systemic Lupus Erythematosus (SLE) Scleroderma Ankylosing spondylitis </td> <td data-bbox="906 1529 1476 1832"> <p>Geriatric anaesthesia</p> <ul style="list-style-type: none"> Pathophysiology of ageing Anaesthetic implications Pre-operative assessment Anaesthetic techniques (advantages/ disadvantages) </td> </tr> </tbody> </table>		<p>Anaesthesia with liver disease</p> <ul style="list-style-type: none"> Anaesthetic implications in patients with liver disease Pre-operative assessment/ stabilization Anaesthetic management in liver transplant 	<p>Anaesthesia at remote sites</p> <ul style="list-style-type: none"> Anaesthetic concerns in remote sites (equipment, patient, staff, procedure) Anaesthetic techniques Specific considerations: <ul style="list-style-type: none"> MRI suites Equipment checklist ECT - 	<p>Anaesthesia with neuromuscular disease</p> <ul style="list-style-type: none"> Applied anatomy of autonomic and peripheral nervous system. Anaesthetic concerns and peri-operative management in; <ul style="list-style-type: none"> Intracranial pathology (cerebral palsy, Parkinson) Spinal cord pathology (spinal cord injury, paraplegia, quadriplegia) 	<ul style="list-style-type: none"> Motor neuron disease (lateral sclerosis) Peripheral neuropathy (Guillain-Barre, diabetic neuropathy) Neuromuscular junction lesion (Myasthenia Gravis, Eaton Lambert syndrome) Myopathy (dystrophia myotonica, muscular dystrophy) 	<p>Anaesthesia with connective tissue disease</p> <ul style="list-style-type: none"> Anaesthetic implications and peri-operative management in; <ul style="list-style-type: none"> Rheumatoid arthritis Systemic Lupus Erythematosus (SLE) Scleroderma Ankylosing spondylitis 	<p>Geriatric anaesthesia</p> <ul style="list-style-type: none"> Pathophysiology of ageing Anaesthetic implications Pre-operative assessment Anaesthetic techniques (advantages/ disadvantages)
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INTENSIVE CARE (Phase 3/Year 4)

NO.	TOPICS			
1.	<p>GIT and liver system</p> <table border="1" data-bbox="296 1984 1476 2054"> <tbody> <tr> <td data-bbox="296 1984 906 2054"> <ul style="list-style-type: none"> Assessment and management of; <ul style="list-style-type: none"> GI bleed </td> <td data-bbox="906 1984 1476 2054"> <ul style="list-style-type: none"> Special considerations; <ul style="list-style-type: none"> Nutrition (enteral vs parenteral) </td> </tr> </tbody> </table>		<ul style="list-style-type: none"> Assessment and management of; <ul style="list-style-type: none"> GI bleed 	<ul style="list-style-type: none"> Special considerations; <ul style="list-style-type: none"> Nutrition (enteral vs parenteral)
<ul style="list-style-type: none"> Assessment and management of; <ul style="list-style-type: none"> GI bleed 	<ul style="list-style-type: none"> Special considerations; <ul style="list-style-type: none"> Nutrition (enteral vs parenteral) 			

	<ul style="list-style-type: none"> - Pancreatitis - Intestinal obstruction - Mesenteric ischaemia - Acute liver failure - 	<ul style="list-style-type: none"> - Hepatopulmonary syndrome - Hepatorenal syndrome
2.	Neuro-intensive care	
	<ul style="list-style-type: none"> • Intracranial haemodynamic and ICP monitoring • ICU management in; <ul style="list-style-type: none"> - Head injury - Traumatic spinal cord injury 	<ul style="list-style-type: none"> • Special considerations; <ul style="list-style-type: none"> - Neuroprotective strategy - Care of organ donor
3.	Trauma	
	<ul style="list-style-type: none"> • Assessment: Primary, secondary, and tertiary survey • Principles of managing trauma / pre-operative stabilisation 	<ul style="list-style-type: none"> • Special considerations <ul style="list-style-type: none"> - Abdominal and extremity compartment syndrome - Resuscitative: permissive hypotension, fluids, line placement
4.	Ethical and legal issues	
	<ul style="list-style-type: none"> • 4 fundamentals of ethics (autonomy, beneficence, non-maleficence, justice) • Special considerations; • Do not resuscitate (DNR) • Withdrawal/ withhold life sustaining therapy • End of life care • Brain death • Organ donation 	<ul style="list-style-type: none"> - Principles of family conference - Supporting patient's family member - Good medical practice principles: <ul style="list-style-type: none"> - Knowledge, skills, performance - Safety and quality - Communication, partnership, teamwork - Maintaining trust

ACUTE & CHRONIC PAIN (Phase 3/Year 4)

NO.	TOPICS	
1.	Acute pain	
	<ul style="list-style-type: none"> • Pain pathway • Management of; <ul style="list-style-type: none"> - Acute perioperative pain - Acute pain in opioid naïve patients - Acute pain in patients chronically using opioids 	<ul style="list-style-type: none"> • Special consideration; Multimodal pain therapy
2.	Chronic pain	
	<ul style="list-style-type: none"> • Definition: tolerance, dependence, addiction, complex regional pain syndrome (CRPS) • Assessment of chronic pain 	<ul style="list-style-type: none"> • Special considerations; <ul style="list-style-type: none"> - Adjuvants - Interventional pain management

STATISTICS (Phase 3, Year 4)

NO.	TOPICS	
1.	Study designs and presenting/ summarizing data	
	<ul style="list-style-type: none"> • Classifications of study designs <ul style="list-style-type: none"> - Observational (case series, case control, cross-sectional, cohort) - Experimental (controlled trial, studies with no control) - Meta-analyses • Scales of measurement: nominal, ordinal, numerical • Summarizing numerical data calculating measures of <ul style="list-style-type: none"> - Central tendency: mean, median, mode 	<ul style="list-style-type: none"> • Summarizing nominal and ordinal data: proportion, percentage, ratio, rate • Relationship between two; <ul style="list-style-type: none"> - Numerical: correlation coefficient - Ordinals: Spearman rank correlation - Nominal: relative risk reduction, absolute risk reduction, odds ratio, number needed to treat

	- Spread: range, standard deviation, percentile, coefficient of variation, interquartile range	
2.	Probability and related topics	
	<ul style="list-style-type: none"> • Null hypothesis and types of error (type I and II), probability • Hypothesis tests: p-value, power • Sampling: reasons, methods • Probability distribution: normal distribution (bell shape curve), skewed, bimodal 	<ul style="list-style-type: none"> • Parametric vs non-parametric test • Measuring accuracy: True positive, true negative, false positive, false negative, specificity, sensitivity
3.	Research question about one group/sample	Research question about two groups/sample
	<ul style="list-style-type: none"> • Parametric tests: <i>t</i> test, z test • Non-parametric tests: sign test, Wilcoxon signed rank test 	<ul style="list-style-type: none"> • Parametric tests: <ul style="list-style-type: none"> - Independent sample: unpaired <i>t</i> test - Paired sample: paired <i>t</i> test • Non-parametric tests: <ul style="list-style-type: none"> - Independent sample: Mann-Whitney test, Kolmogorov-Smirnov test - Paired sample: Sign test, Wilcoxon signed rank test, chi-square
4.	Research question about more than two group/sample (K-sample)	
	<ul style="list-style-type: none"> • Parametric test: 1-way ANOVA, 2-way ANOVA, Pearson correlation coefficient (<i>r</i>) 	<ul style="list-style-type: none"> • Non-parametric test: Friedman test, Kruskal-Wallis test, Spearman rank

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http://www.wnaza.com/N_Main.aspx

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3. Irwin & Rippe's Manual of Intensive Care Medicine, 6th edition. Authors: R S Irwin, J M Rippe & W Kluwer
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2. Physics, Pharmacology and Physiology for Anaesthetists: Key Concept for the FRCA. Authors: M E Cross & E V E Plunkett. Cambridge Medicine
3. Primary FRCA in a box, 2nd edition. Authors: B Clifton, S Armstrong & L Davis. CRC Press
4. Dr. Podcast Scripts for the FRCA. Author: R A Leslie. Cambridge Medicine
5. Short Answer Questions and MCQs in Anaesthesia and Intensive Care (2nd Edition). Murphy & Dashfield. Hodder Arnold (2013).
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2. Anesthesiology
3. Anaesthesia & Intensive Care
4. Anesthesia and Analgesia
5. Anesthesia Clinics of North America
6. Acta Anesthesiologica Scandinavica
7. British Journal Anaesthesia
8. Canadian Journal of Anesthesia
9. Current Anaesthesia and Critical Care
10. Current Opinion in Anaesthesiology
11. Journal of Cardiothoracic and Vascular Anaesthesia
12. Journal of Clinical Anesthesia
13. Journal of Intensive Care Medicine
14. Pain Medicine
15. Pain

Intensive Care

1. American Journal of Respiratory Critical Care Medicine
2. Critical Care Medicine
3. Critical Care Clinics
4. Critical Care
5. Current Opinion in Critical Care
6. Intensive Care Medicine
7. Journal of Critical Care
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