TCH Emergency Department Guide to the ACEM Primary Exam

The primary exam is the component of training which has the biggest potential as a roadblock (although certain 4.10 candidates may beg to differ!). It is the component of training which often appears the most onerous from a trainee perspective but nonetheless contains important knowledge to provide a base for your future as an emergency specialist.

There are some structural changes to the exam coming from 2013.2 onwards which will potentially change the preparation for the exam.
For the purpose of this guide, it will be assumed that the candidate is aiming to sit all four subjects at once. From 2013.2 onwards, it is our strong recommendation that this is the way the exam is attempted.

EXAM OVERVIEW (from ACEM handbook)

1. OBJECTIVE OF PRIMARY EXAMINATION

The objective of the primary examination is to ensure that trainees have the required level of knowledge and understanding of the four basic sciences of anatomy, pathology, physiology and pharmacology (insofar as they relate to emergency medicine) to underpin their further learning and development towards careers as emergency physicians. The examination is criteria-referenced, which means that candidates are required to reach a pre-defined level of performance to pass the examination rather than a fixed percentage of candidates being successful. In other words, provided all candidates meet the standard, a 100% pass rate is possible.

2. EXAMINATION STRUCTURE (from ACEM handbook)

The current structure of the primary examination is as follows:
Two sittings of the primary examination are held annually.
It is comprised of: (a) an online MCQ examination (held regionally); and (b) an oral examination (held at a single site).
The MCQ and oral components of the examination are held approximately six weeks apart.

Online MCQ Examination

The online MCQ examination of 1½ hours duration is held in each of the four basic sciences. The examination is held over the course of one day. Each exam is 60 questions.

Candidates scoring 8 or greater out of 20 will be invited to present to the oral examination.

Oral Examinations

Each candidate undergoes a 10-minute examination by a pair of examiners in each of the four basic sciences. The examination is held over one or two days, depending on the number of candidates presenting.
To pass the primary examination overall, both the online MCQ examination and the oral examination must be passed at the same sitting of the examination. A pass in the MCQ at one sitting will NOT be carried over to a subsequent sitting of the primary examination.
This structure will continue to apply in respect of the 2012.1, 2012.2 and 2013.1 examinations only.

2.1 Changes to be implemented as of the 2013.2 examination

The primary examination will remain a basic sciences examination consisting of the current four subjects.

MCQ Component

Candidates will sit an MCQ examination in each subject, which will take the same form as the current MCQ examination, and they may sit as many subjects as they wish at each exam sitting.
All four MCQ papers must be passed before the viva component may be attempted.

Viva Component

The viva will consist of four scenario-led oral examinations, each with topics from each of the four subjects. Each candidate will sit four vivas in a session, and must overall pass the four combined vivas at one exam to complete the primary examination.
Examiners will be examining aspects of all four subjects within their vivas.

Credit Transfer

Candidates who have completed some, but not all four, subjects prior to the 2013.2 examination will be granted credit transfer in respect of the MCQ component only in the relevant subject/s within the new structure. They will then have to pass the MCQ component of the remaining subject/s and, once those are all completed, they will then have to complete the combined viva to complete the primary examination.
NB: The combined viva will contain topics from all four subjects, even if the candidate has previously passed that subject in the previous system.

3. EXAMINATION CONTENT

All the information below relates to the current examination structure. Further information regarding the structure to become effective as of 2013.2 will be available in due course.

MCQ Examination

The multiple choice questions are type A questions: choose the one most correct response from four options. Electronic devices (calculators, palm pilots etc), pre-formatted notes or other written material may not be brought into the examination room. Material on which notes have been made may not be taken from the examination room.

Oral Examination

Props such as bones, normal X-rays and anatomical models are used in the anatomy viva, but not in the other subjects. Of particular note, pathology specimens are not used.

Marking

The MCQ is marked out of 20 according to a marking scale (see below) that converts the raw score out of 60 into a score out of 20. The viva voce is marked out of 10. A combined score of 15 or more in each subject (by any combination) is required in order to pass the subject.

MCQ Scaling system

Each candidate's raw score is converted to a percentage of answers correct. This percentage correct is determined after any individual MCQs are "deleted". In cases where it is found that more than one option was correct, but not sufficient to delete the question, then all candidates who responded with EITHER of the correct answers will be deemed correct.
A linear scale from 0 to 20 is applied to the percentage correct between 20% and 100% to obtain a final score out of 20 (see below).
Therefore, assuming that no questions are deleted, a score of 36/60 (60% raw) is required to score a scaled mark of 1.
It is likely that this scaling system could change as of the 2013.2 primary examination. Further details will be advised via the Trainee E-News.

EXAM syllabus

http://www.acem.org.au/media/publications/HB13_v02_Primary_Syllabus.pdf

Please read the syllabus in detail and the guide to the structure of the exam.
http://www.acem.org.au/media/publications/HB12b_v02_Primary_Exam_-_structure.pdf

The important messages here are that focus needs to be based around level 1 topics and those weighted heavily in the MCQ matrices.

EXAM PREPARATION and STUDY

There are multiple different successful methods to prepare for the 4 subjects of the primary exam. Successful techniques at TCH have included: 3 months off work full time study; 6 months of after work study with time off before the exam; 12 months of after work study; some part time hours in the context of a 6-12 month build up.

Leave must be planned well in advance which means leave forms approved before rosters written. We strongly suggest all those sitting getting together as a group and pre discussing leave intentions to avoid conflicts and allow 'peaceful' resolution.

The common denominator in all of these approaches is enough hours committed. Your preparation needs to be one based around your family, social and work life and has to be one that will work for not only you, but your support networks as well.
Given the often tedious nature of the study, it is important that the primary exam is attempted with a full commitment. It has been our experience that a 'see how I go' approach is universally

unsuccessful as an exam strategy. Extending the pain indefinitely is generally unsuccessful as a life strategy as well!

It is important to play to your strengths. Are you a visual learner? Do you need frequent study breaks or prefer to study for long periods? Can you study at home, or should you come to the library? Do you like to write summaries or highlight your textbook?
Use the methods that have worked for you in the past.
Factor in a time period to warm up at the start of the process as we all would agree it takes a month or so to 'get into' your study. Accordingly factor in extra time for major life events. Planning to get 15 powder days in for an August exam is unlikely to be a successful process however.

Study focus

It is always very important to remember that the point of the study process is passing the exam. Thus the study process needs to be directed towards exam focused activities as opposed to 'reading for general interest'.

As a general rule it makes sense to use the MCQ matrices of weighting to design your study program. An excellent result in the MCQ paper ***nearly*** guarantees success in the overall exam.

You will find that the weighting is generally based around the topics with higher emergency medicine relevance. For example upper and lower limb make up 50% of the anatomy MCQ topics.

In general in makes sense to begin at the start of the syllabus for each subject. The overview chapters provide a solid base for progressing with the subject in further detail.
In general it also makes sense to try to 'pair' anatomy with pathology and physiology with pharmacology. You will find that there is significant overlap in the basic principles of these subjects, saving time in the study process. It also makes sense to cover related topics at the same time. Eg learning about the anatomy of the brain whilst reading about Monro Kellie, Subdural haemorrhages and mannitol helps to tie knowledge together and increase it's relevance to work.

For this reason it is important to maximise your work-study overlap. When you are sedating a patient, ask yourself (or your colleague) about airway anatomy, the path of the cephalic vein, the pharmacology of propofol and the receptors involved in vasodilation. Making the syllabus interesting and work relevant is one of the keys to making this process worthwhile and tolerable!

It is extremely important to allow enough time in the process to allow practice of questions. A large amount of knowledge reinforcement and acquisition is done by doing MCQ and viva questions as part of your study.

Study groups are often helpful to provide a regular benchmarking as well as useful for practising questions.

STUDY PLAN

Given the substantial variation in prior knowledge, learning types, social circumstances etc Study plans should be individualised based on what makes sense for you. There are many available examples online from a multitude of sources.
See Appendix for two examples of a study program.

An example of a successful 6 month program from a FACEM here is as follows.

Example Study plan for 6 months for ACEM primary.

Months 1-4 (full time work, after hours study 10-20hrs/week) : Begin by reading the syllabus and matching the topics which overlap between subjects. Plan to study these overlapping topics at the same time. Get or make the list of viva topics and organise them for each subject from past papers (there is an electronic version which should be updated yearly that the registrars have). Write exam focused summaries of the 4 main topics, working from start to finish of the syllabus. At the start of each section ***before*** starting summarising read the Syllabus and LOAs for the section, look at the viva questions for that topic and those which occur commonly and scan the MCQs for that topic.
Make sure you draw the major graphs and read the important tables for each subject. Try not to get bogged down on fine detail.
At the end of each summary section, do some MCQs and write some viva answers as reinforcement.

Any understanding gaps need to be dealt with at this stage. Ask for help to understand a concept before moving on.

Month 5 (F/T work) Write viva answers for past topics with a focus on the common topics. Do MCQs from as many sources as possible. Revise your summaries

Month 6 (Part time work (0.5) for 3 weeks, I week off for study before the exam) Do MCQs and revision concurrently (changing topics twice a day). Practice vivas for a change of scene. Try and answer everything from your summaries to further reinforce what you know.

POST MCQ and pre VIVA . Don't get sucked into a motivation vortex after the MCQs, keep the pressure on by practising exam technique as much as possible and revising main topics with a viva focus. Schedule frequent sessions with your colleagues.

EXAM TIPS

MCQs

Good performance in the MCQ should be a major focus as in many ways it is the key to passing the exam.
There is a large amount of overlap from prior exams and there are only a finite number of ways to ask questions about a topic. Practising past questions is integral to passing. Do not leave yourself a few days to practice MCQs because you haven't covered the syllabus yet. It is far better to use the MCQs to guide what study is left than plug on without the MCQ focus.

Write your own MCQs… with a study group you can cover most of the available topics .
Understanding how to write an MCQ is an excellent way to understand how to answer them. You can usually use elimination to get down to at least 50/50 .

VIVA

Practice under pressure. That is the key to performing on the day!

Noone likes vivas, but understanding yourself and how to respond when you are feeling the pressure is most important and the only way to get this knowledge is by practising in situations where you feel under the pump.

Having a set structured answer for the various types of question can be a good fall back .

Try to start by answering in an 'overview' style and the detail will flow as you relax.

Have a standard line to get yourself started…. as Alan Partridge would say "Speaks to fill embarrassing silence".
Often a good solution is to repeat the question back before commencing your answer.

If you are completely stuck ask the examiner to repeat the question.

Make eye contact and smile, speak clearly .

Don't embark upon long unstructured lists when answering questions. The line "examples include x and y" implies depth of knowledge and doesn't leave you hanging if you start with "Scorpions' as a cause of pancreatitis and get stuck there!!
Make sure you learn (then state) the most relevant and important in any list and leave the rest for bonus marks!

Practice drawing graphs for other people.

What support do I get at TCH?

Primary exam sessions will be held weekly on Wednesdays at 0800 in the tutorial room. Coming prepared is important as we are not going to teach you the syllabus. The sessions are intended to:

- allow benchmarking for your progress
- provide explanations for difficult concepts
- provide exam style conditions for practice
- help with study, bounce off ideas, provide support..we've all been there done that!

EXAM resources

ACEM website: In training program information/primary exam there are resources such as past viva Qs, video tutorials, practice MCQ. In trainee home/resources/non acem resources are MCQs from the NZ primary course

Other websites
There a multitude of online resources to assist in primary exam preparation. Some are well known such as 'life in the fast lane'. Others can be found via the magic of google.

Registrar room.
There are 2 massive bags of past Qs in the locked cupboard in the reg room, as well as copies of the text books. Make sure you all get together to to ensure you all have access. A good principle is to ensure that stuff never leaves the room. Hoarding is not acceptable.

TCH library. Copies of required texts are available in the ANU/TCH library.

Other consultants and registrars. Ask around for an approach that suits your style. Ask your colleagues for inside goss and recent tips.

Appendix.

Appendix 1

Week 1

Subject	Topics	Source material	Questions
Pharmacology	Pharmacodynamics	Katzung	• Definitions – Receptors, potency, efficacy, agonist, antagonist, spare receptor • Name different types of antagonist, and give examples • Draw – Dose response curves for agonist/antagonist/partial agonist • Describe different types of receptor, and give examples. • Describe mechanism of action of 2nd Messengers with examples
Physiology	Body Fluids	Ganong	• Definitions – osmosis, osmolality, osmolarity, solute, diffusion • Describe the distribution of water in the body, and percentages in each compartment • Describe the principles of measurement of ECF/Plasma/Total body water • Give values of intracellular/extracellular cations and anions • Describe the movement of ions across cell membranes and the various pumps involved
Anatomy	Tissues and Structures	Moore	• Describe the structure of skin and glands • Describe the structure of hair • Describe structure of muscles and tendons • Describe structure of bone • Describe comparative anatomy of a child
Pathology	Normal Cell Injury/Adaptations	Robbins	• Definitions of hypertrophy, hyperplasia, atrophy, metaplasia, dysplasia, • Describe mechanisms of cell inj. and death • Describe morphology of reversible and

			irreversible injury • What is apoptosis, and describe its mechanism, and morphology • Describe different types of necrosis, with examples, and morphology • What is the mechanism of reperfusion injury

Week 2

Subject	Topics	Source material	Questions
Pharmacology	Pharmacokinetics	Katzung	• Definitions – VD, clearance, half life, bioavailability, dosing rate, loading dose • What factors affect the volume of distribution • What is zero order and first order kinetics • Give examples of drugs with high/low extraction ratios
Physiology	Nerve & Muscle	Ganong	• Define the resting membrane potential. How does it arise? • Describe ionic basis of action potentials. • Describe the different types of nerve fibre, and their susceptibility to hypoxia, pressure and local anaesthesia • Describe transmission of AP at synapse, and NMJ • Describe how a muscle contracts – sliding filament theory. SM/cardiac
Anatomy	Nervous System	Moore	• Describe layout of CNS/PNS • Components of autonomic nervous system • Gross structure of brain and spinal cord. • Describe segmental innervation in terms of dermatomes/myotomes • Be able to demonstrate dermatome distribution and myotomes, and root values of major upper and lower limb movements and reflexes
Pathology	Inflammation	Robbins	• Describe the key features of acute inflammatory response • Describe the vascular response to injury • Describe mechanisms of increased vascular permeability • Can you list the key inflammatory mediators of inflammation • What are the outcomes of acute inflammation • What are the cell types involved in chronic inflammation • What are the morphological features of

			acute and chronic inflammation

Week 3

Subject	Topics	Source material	Questions
Pharmacology	Biotransformation	Katzung	• Describe biotransformation reactions in the liver, using paracetamol as e.g • List phase 1, and 2 reactions • List drugs that induce Cytochrome P450 pathways • List drugs that inhibit Cytochrome P450 pathways • Describe process of clinical trials
Physiology	Nervous System	Ganong	• Describe simple stretch/ withdrawal reflexes. • Describe sensory pathway of vision • What is the reticular activating system • Describe the functions of the hypothalamus & temperature regulation • Describe the ascending and descending tracts in the spine • Describe features of central cord syndrome/cauda equina, cord transection
Anatomy	Upper Limb I Pectoral Girdle Axilla	Moore	• What is a girdle, how does it function? • Osteology of clavicle, scapula and humerus • Describe the AC and sternoclavicular joint, + ligaments • Describe attachments and nerve supply of muscles attaching limb to trunk • Describe the blood supply to the breast • Describe boundaries and contents of axilla • Describe the scapular anastomosis
Pathology	Healing and Repair	Robbins	• Describe the process of wound healing, and scar formation • What is healing by primary and secondary intention • What cells are capable of regeneration and can you describe the cell cycle. • Describe the process of fracture healing • Describe the factors that affect wound and fracture healing • What is metastatic and dystrophic calcification?

Week 4

Subject	Topics	Source material	Questions
Pharmacology	CV drugs I Antiarrhythmics Inotropes	Katzung	• List the Vaughn Williams classification for antiarrhythmic drugs • List the drugs in each class • Learn PK of Amiodarone • Learn about mechanisms of additional drugs – digoxin and adenosine • Compare and contrast use of adrenaline/noradrenaline/dopamine • Which situations would you use the above drugs?
Physiology	CVS I – heart, cardiac cycle, conduction	Ganong & Guyton	• Describe electrophysiological basis of ECG • Describe (Draw) AP of SA node and AV node, and compare with myocyte • What is the ionic basis of AP in AV node, and the diastolic pre potential • Which fibres have the fastest and slowest conduction • Describe the cardiac cycle (draw). Volume pressure loop.
Anatomy	Upper Limb II Upper Arm	Moore	• Osteology of humerus • Quadrangular and triangular space • What muscles attach to the coracoid process • What are the muscle attachments to the intertubercular groove • Describe the attachments and nerve supply of biceps, coracobrachialis, brachialis, and triceps. • What are the features contributing to stability of shoulder joint?
Pathology	Fluid haemodynamics	Robbins	• Describe the pathogenesis of oedema (starling forces etc) • List different types of shock • Describe pathogenesis of shock (detail on septic and haemorrhagic) • Definition of haemorrhage/ecchymosis/petechial bleeding • Define embolism/thrombus/infarction • Can you draw the coagulation cascade and describe main features

Week 5

Subject	Topics	Source material	Questions
Pharmacology	CV drugs II Anti-anginals Antihypertensives	Katzung	• Describe pharmacological properties of nitrates • Describe pharmacological basis of

			calcium channel blockade using verapamil as an example • Describe the main features of B-Blockers and list different types, and the types of blockade that they cause • Discuss the side effects and toxicology of B blockade (Propranolol)
Physiology	CVS II Physics of Flow Pressure Resistance Vessels	Ganong & Guyton	• What is Poiseuille's Law? • Describe laminar and turbulent flow • What is Reynolds number? • What is compliance and distensibility of vessels? • Describe Laplace's law, and its relevance to aneurysm formation • Principle of autoregulation – myogenic theory, local factors
Anatomy	Upper Limb III Forearm	Moore	• Name the muscles /attachments/nerve supply of the flexor compartment • Name the muscles /attachments/nerve supply of the extensor compartment • What are the individual compartments of the extensor compartment • What are the boundaries and contents of the cubital fossa • Describe osteology of radius and ulnar. What is the carrying angle? • What is the axis of rotation for pronation/supination • Describe the ligaments around the elbow joint
Pathology	Immune System Neoplasia	Robbins	• Describe host barriers to infection. Outline innate/humoral immunity. • What is the role of macrophage/B Cell/T cell in immune response • Outline the role of complement, and draw complement cascade • Define hypersensitivity reactions, describe, with examples of each • What is an oncogene? Define paraneoplastic syndrome and give examples. • Benign V malignant tumour and invasion. • Discuss pathogenesis of common cancers - lung

Week 6

Subject	Topics	Source material	Questions
Pharmacology	CV drugs III Diuretics	Katzung	• Describe the pharmacological basis of different types of diuretic • Indicate which part of the nephron different diuretics act on

			• Describe PK of frusemide, thiazides, carbonic anhydrase inhibitor, as well as K sparing • Toxicology/side effects of diuretics – and uses in hypercalcaemia
Physiology	CVS III Control Autoregulation Renin angiotensin Aldosterone	Ganong & Guyton	• Describe reflex controls of BP – baroceptors • Describe physiological response to loss of 1L of blood • Describe physiological response to infusion of 1L of normal saline • Describe long term control of BP – RAA axis • Discuss factors influencing CO and venous return • Draw vascular function curves of Guyton and Starling • Discuss autoregulation in brain/kidney/coronary circulation
Anatomy	Upper Limb IV Wrist Hand	Moore	• Describe the flexor retinaculum • Describe the structure and layout of carpal tunnel • Describe extensor expansion, and function of lumbricals (innervation too) • Function of interossei and thenar/hypothenar muscles (OAF) • Nerve distribution to the hand • Describe boundaries and contents of anatomical snuff box • Osteology of carpal bones
Pathology	Infectious disease	Robbins	• Classification of bacteria • Define virulence factors of staph. Aureus • Describe pathogenesis of cholera/typoid/salmonella • Describe pathogenesis of HIV/herpes simplex/CMV/Measles • Describe different organisms involved in pneumonia/meningitis/endocarditis and UTI • Compare and contrast hepatitis A-D

Week 7

Subject	Topics	Source material	Questions
Pharmacology	CV drugs IV Anticoagulants	Katzung	• What are mechanisms of heparin/warfarin/aspirin/clopidogrel/TPA • What is mechanism of Vit K • Adverse effects of heparin • Adverse effects of warfarin • Interactions of heparin and warfarin
Physiology	CVS – IV CO/VR Special	Ganong & Guyton	• Describe CSF circulation in the brain. How much/where etc • Describe coronary circulation –

	circulations		subendocardial/epicardial – flow during systole and diastole in RV & LV • Describe renal blood flow • Describe pulmonary blood flow • Learn table in Ganong with CO and flow through various organs
Anatomy	Upper Limb V NV Transitional zones	Moore	• Draw brachial plexus • What is the course of median/radial/ulnar nerve in arm and forearm • What are branches of axillary artery? Where does it start and end • Describe the blood supply to hand • Describe the venous drainage of upper limb • Quadrangular/triangular space/Axilla/Cubital fossa/Carpal Tunnel/anatomical snuff box
Pathology	Blood vessels	Robbins	• Describe pathogenesis of atherosclerosis • Describe pathogenesis of aneurysms and classification • What is aortic dissection? • Describe pathogenesis of vessel wall damage

Week 8

Subject	**Topics**	**Source material**	**Questions**
Pharmacology	Neuro I	Katzung	• Describe the classification of cholinoreceptors • Describe the actions and give examples of anticholinesterase inhibitors • Describe the pharmacology of anticholinergics – atropine • Can you describe the classification of inotropes • Describe the effects of adrenoceptors and distribution in the body
Physiology	Resp I Structure and function	Ganong & West	• Describe gas transport in the lung • What is anatomical dead space, and the Bohr equation • Define lung volumes – draw curves, and describe method of measurement • O2 and CO2 transport in lung – concept of diffusion v perfusion limited • Where is most resistance in the airways?
Anatomy	Lower Limb I	Moore	• Outline contents and boundaries of femoral triangle • Describe the different compartments of the thigh, with muscles and nerve • Describe the femoral canal/ring, and relations, landmarks for fem art. Line • What are the boundaries and contents of the adductor canal?

			• Describe the course of the sciatic nerve • Describe the stability of the hip • Osteology of pelvis and femur
Pathology	Heart I	Robbins	• Pathogenesis of IHD/MI including risk factors and distribution of thrombus • Sequelae of AMI • What is reperfusion injury • What is the microscopic and macroscopic morphology of MI? • Describe the pathogenesis of bacterial endocarditis and list the common pathogens.

Week 9

Subject	**Topics**	**Source material**	**Questions**
Pharmacology	Neuro II LA GA Muscle relaxants	Katzung	• Describe pharmacological properties of lignocaine and prilocaine • Describe the pharmacological properties of common agents – NO, Isoflurane • What is the MAC? • Classify muscle relaxants • Pharmacology of suxamethonium vs atracurium.
Physiology	Resp II Ventilation and diffusion	Ganong & West	• Describe regional differences in ventilation and perfusion in the lung • What is the alveolar gas equation? • Can you classify the causes of hypoxia? • Which cells synthesize surfactant, and what is its function • What is lung compliance? Can you give causes of increased and reduced complicance?
Anatomy	Lower limb II Pelvis Lateral rotators	Moore	• Describe the muscles / attachments/nerves of gluteals and lateral rotators • Define greater and lesser sciatic foramina, and list what goes through each • Relations and surface markings of the sciatic nerve and piriformis • Describe osteology of the pelvis • Describe the ligaments of the pelvis, and the SI joint. • Which is stronger – anterior or posterior SI joint?
Pathology	Heart II	Robbins	• Describe the morphology of cardiomyopathies • What is pericarditis • What are the common causes of pericarditis? • What is rheumatic fever? • Which antibodies are associated with rheumatic fever?

Week 10

Subject	Topics	Source material	Questions
Pharmacology	Neuro III Sedatives Anticonvulsants Etoh	Katzung	• Describe the PK of thiopental/propafol/ketamine – side effects (ICP) • Describe the mechanism of action of benzodiazepine • Describe ionic/receptor basis for inhibition – GABA Chloride channel • Describe acute and chronic effect of alcohol ingestion • Describe tolerance with relation to ethanol
Physiology	Resp III Blood flow Metabolism Gas transport	Ganong & West	• Describe the pulmonary circulation • Describe the phenomenon of hypoxic vasoconstriction • What substances are metabolised/removed by the lungs? • How is CO2 and O2 transported in blood? • Draw O2 and CO2 dissociation curves • Explain Bohr Effect and Haldane Effect
Anatomy	Lower Limb III Popliteal fossa Knee	Moore	• Describe the boundaries and contents of the popliteal fossa • Describe the knee joint • Describe the action and significance of popliteus • Which bursae communicate with the knee joint? • What are offers stability to the knee joint and patella? • Describe the cruciate anastomosis around the knee • Describe the knee capsule and ligaments
Pathology	Lungs I Atelecatsis Asthma COPD ARDS	Robbins	• What is atelectasis? • Describe the pathogenesis and morphology of asthma • Describe the morphology and pathogenesis of the COPDs • What types of emphysema are there? • How does alpha 1 antitrypsin relate to emphysema? • What is the pathogenesis and morphology of ARDS • What are the most common causes of ARDS?

Week 11

Subject	Topics	Source	Questions

		material	
Pharmacology	Neuro IV Antidepressants Antipsychotics	Katzung	• Describe the biogenic amine theory for depression • Describe classification of antidepressants • Describe classification of antipsychotics • What are the adverse effects of the antipsychotics? • What is serotonin syndrome? • What is PK of lithium?
Physiology	Resp IV Central and Peripheral control	Ganong & West	• Describe the different sensors involved in ventilation • Describe the respiratory sensors in the brain • Where are the peripheral chemoreceptors located and how do they respond to changes in CO2 and O2? • What is the Herring Breuer reflex? • What is the role of stretch receptors in the lung?
Anatomy	Lower limb IV Lower leg	Moore	• Describe the compartments of the leg, including muscle attachments and nerve supply • What is the blood supply to the leg? • Describe the medial and lateral ligaments of the ankle • Describe the relations of the medial malleolus • Describe the myotome segmental innervation to leg • Osteology of tibia and fibula
Pathology	Lungs II Pneumonia APO PE	Robbins	• Describe the pathogenesis and morphology of pneumonia • What are the pathogens involved in pneumonia (+ atypicals and immunocompromised)? • What is the pathogenesis of APO, and what is the morphology? • What is a PE? Where do they come from? Name different types of embolus and their source. • What are the complications of PE?

Week 12

Subject	Topics	Source material	Questions
Pharmacology	ABx I Betalactam Aminoglycosides Sulphonamides	Katzung	• What is the mechanism of action of these agents? • Classify the cephalosporins into generations. • What is the PK and toxicology of Gentamycin? • What is unique about doxycycline? • What is concentration dependent, and

			time dependent killing? • What is trimethoprim? What is it's mechanism of action and PK
Physiology	Renal I	Ganong & Vander	• Describe structure and function of kidney – medulla/cortex • How would you measure renal blood flow? What would you use? • What is renal clearance and how is it measured? • What factors affect GFR? • What is the JGA? • What causes mesangial contraction?
Anatomy	Lower Limb V Foot	Moore	• Describe the sensory distribution of the foot • Describe the layers of the sole • Describe the arterial supply and venous drainage of the foot • What do the lumbricals of the foot do? • Describe the components of the longitudinal and transverse arches of the foot • Osteology of the foot/ attachments
Pathology	Renal I	Robbins	• Classify the main glomerular diseases • Describe the pathogenesis of ARF/CRF • What are the causes of ARF? • What are the stages and outcomes of ARF? • Post is post strep glomerulonephritis? How does it present? • What are the features of nephrotic syndrome?

Week 13

Subject	**Topics**	**Source material**	**Questions**
Pharmacology	Abx II Macrolides Quinolones Resistance	Katzung	• Describe mechanism of action of macrolides • Erythromycin vs azithromycin • What pathogens do the macrolides target • Describe the pharmacology of norfloxacin • Describe the main mechanisms of bacterial resistance
Physiology	Renal II	Ganong & Vander	• Describe the features of ionic movements in the nephron • Describe the counter current multiplier system in the loop of henle • Describe the role and action of diuretics on various parts of the nephron • Describe the effects of vasopressin on the collecting duct • Describe hydrogen ion excretion and the kidney

			• What is tubuloglomerular feedback?
Anatomy	Lower limb VI Transitional Zones Neurovascular	Moore	• Femoral triangle/adductor canal • Popliteal fossa – boundaries and contents • Achilles tendon • Distribution of saphenous veins • Arterial supply to leg • Superficial and deep inguinal nodes and what they drain
Pathology	Renal II Calculi GU	Robbins	• Pathogenesis and classification of renal stones • List the main GU diseases

Week 14

Subject	Topics	Source material	Questions
Pharmacology	Abx III TB Antivirals Antiseptics	Katzung	• Describe the treatment of TB • Describe PD and PK of acyclovir • What conditions can acyclovir treat? • What is chlorhexidine and how does it work?
Physiology	Acid Base Buffers	Ganong	• Describe major buffer systems in the ECF and ICF (HCO_3^- etc) • Derive the Henderson Hasselbach equation • How does the lung and the kidney help regulate acid base balance? • What are the causes of metabolic acidosis? • What are the causes of metabolic alkalosis • What is the anion gap? • Affects of exercise and altitude
Anatomy	Head & Neck I Triangles of neck Foramina of skull	Moore	• Describe boundaries and contents of ant/post triangles of neck • Describe the deep fascia in the neck. • Describe layers pierced for a cricothyroidotomy • What are the branches of external carotid? • List the foramina of skull and what go through them • Describe the osteology of typical vertebrae from C/T/L spine • Describe osteology of C1/2/atlantooccipital//atlantoaxial joint
Pathology	Liver Cirrhosis Hepatitis	Robbins	• Describe the pathogenesis and morphology of alcoholic liver disease • What are the sequelae of alcoholic liver disease? • What are the causes of jaundice?

			• Classify hepatitis A-D – features, carrier state etc • What parasites can affect the liver? • What is the pathogenesis of malaria?

Week 15

Subject	Topics	Source material	Questions
Pharmacology	Analgesic Drugs Opiates NSAIDS Paracetamol	Katzung	• Describe the pharmacology of morphine/fentanyl and naloxone • What are the 3 different opiate receptors, and what do they cause? • What is the mechanism of action of ibuprofen? • Describe PK and metabolism of paracetamol • Describe management of paracetamol toxicity
Physiology	Digestion and absorption	Ganong	• Describe how carbs/protein/fat is absorbed and digested in the GIT • What are the carriers for glucose/fat/proteins? • Where are the vitamins ADEK absorbed? • Where is iron absorbed? • Where is the most water absorbed?
Anatomy	Head & Neck II Face Mouth Larynx Pharynx	Moore	• Describe innervation of tongue • Describe the structure and landmarks of the larynx • Describe the nerve supply of the intrinsic muscles of the larynx • What is the course of the facial nerve? • What are the branches of the facial nerve? • What bones make up the orbit? • What is the neurovascular supply of the scalp? • Describe the Circle of Willis and venous drainage
Pathology	Pancreas	Robbins	• Describe the pathogenesis and morphology of acute pancreatitis • Describe the pathogenesis of diabetes mellitus types 1 & 2 • Describe the pathogenesis of cholecystitis

Week 16

Subject	Topics	Source material	Questions
Pharmacology	Respiratory & GI	Katzung	• Describe the pharmacology of salbutamol and aminophylline • Describe the pharmacology of ipratropium

			bromide • Describe the pharmacology of sodium cromoglycate • Describe the pharmacology of corticosteroids • Describe the pharm of PPI, and antiemetics
Physiology	GIT	Ganong	• Describe how the GIT is regulated (Enteric Nervous System) • Describe factors affecting gastrin/gastric acid secretion • Describe the factors affecting insulin and glucagon secretion • Describe the composition of bile salts • Describe the physiology of peristalsis
Anatomy	Thorax I Heart and great vessels	Moore	• Describe the structure of the chest wall and intercostal space • Describe the divisions and contents of various parts of the mediastinum • Describe what levels the aorta/oesophagus/inf. Vena cava enter the thorax • Describe the course of the thoracic duct • What are the relations of the first rib • Describe landmarks for a ICC and what layers do you go through? • What are the surface markings of lungs and pleura?
Pathology	GIT Endo	Robbins	• Describe the pathogenesis of Graves disease • Describe the pathogenesis of Diabetes Type 1 &2 • Describe the features of panhypopituitarism • Describe the pathogenesis of Cushings/Conns/Addisons • Describe the pathogenesis of inflammatory bowel disease • Describe the pathogenesis of ischaemic bowel

Week 17

Subject	Topics	Source material	Questions
Pharmacology	Autocoids & endocrine	Katzung	• Can you outline the current rational for migraine treatment? • How do antihistamines work? • Describe the pharmacology of insulin and glucagon • Describe the adverse effects of Carbimazole
Physiology	Endocrinology Thyroid Adrenal	Ganong	• Describe key steps in synthesis of thyroid hormones • Describe the synthesis of catecholamines

	Pancreas Calcium		and enzymes involved • Describe the physiology of insulin effects on adipose/muscle/liver • Describe how calcium homeostasis is achieved • What are the responses to hypocalcaemia/hypercalcaemia
Anatomy	Thorax II Heart & Great Vessels	Moore	• Describe the surface marking of the heart in the anatomical position • What makes up the right and left border on CXR • Describe the blood supply to heart, and venous drainage • What is R & L dominance? • Describe the aortic arch and relations to trachea • Describe the internal surface of R atrium • Describe relations of the trachea and blood supply
Pathology	CNS	Robbins	• Describe the pathogenesis of CVA • Describe pathogenesis of cerebral aneurysm • Describe pathogenesis of meningitis viral and bacterial • What are non infective causes of meningitis • Pathogenesis of common brain tumours • Describe the pathogenesis of MS/Guillan Barre.

Week 18

Subject	Topics	Source material	Questions
Pharmacology	Toxicology	Katzung	• Paracetamol • Opiate • Benzodiazepine • TCA • Anti depressants • Use of charcoal
Physiology	Metabolism	Ganong	• Describe metabolism pathways for carbs/protein/fat • What are the RQ values for brain/muscle?
Anatomy	Abdomen I	Moore	• Abdominal wall and peritoneum – structures – T12/L1 cross section CT • Branches of abdominal aorta and vena cava, coeliac trunk • Fascial layers of the abdomen • Relations of the ingunal canal • Foregut – stomach and blood supply

			• Surface markings of spleen. • What are the relations of the kidneys?
Pathology	Musculoskeletal Skin	Robbins	• Fracture healing • Disease of bone • What is pathogenesis of RA/OA • What are the main myeloproliferative disorders? • ALL/CLL/lymphoma • Aplastic anaemia • Skin infections

Week 19

Subject	Topics	Source material	Questions
Pharmacology	Old age/Pregnancy	Katzung	• Pharmacological considerations of the elderly • Which drugs should be used in caution in the elderly? • How does metabolism in the liver change in the elderly • Give examples of drugs that are not safe in pregnancy
Physiology	Blood	Ganong	• Describe the physiology of plasma and lymph • Describe the ABO system for transfusion •
Anatomy	Abdomen II & Spine	Moore	• Stomach/Small bowel/Large bowel • What are the relations of head of pancreas? • What are the relations of the duodenum – describe its course and vertebral levels • Describe blood supply to gut/liver/spleen • Describe the course of the ureters • Ligaments of the vertebral column, and layers for lumbar puncture
Pathology	Environmental	Robbins	• Effects of smoking • What are the effects of lead poisoning • Describe the pathogenesis of electrical injury • Describe the effects of radiation on various parts of the body • Describe long term effects to ethanol abuse

Week 20 Bringing it All Together

Subject	Topics	Source material	Questions
Pharmacology	Key areas	AMK books	• Review of cardio/renal drugs • Review of anaesthetic agents

		Past exam Qs	• Review of sedatives • Review of PK/PD/Biotransformation
Physiology	Integration	AMK books Past exam Qs Phys Viva book – Kerry Brandis	• Inter-relations of CVS/Lung/Central control • Affects of altitude and exercise on cardiorespiratory function • Learn 20 listed tables from Ganong
Anatomy	Transitional Zones	AMK books Past exam Qs McMinn Atlas Skeleton Netter Flash Cards Models	• Triangles of neck • Axilla • Cubital Fossa • Carpal Tunnel • Femoral triangle/canal • Popliteal Fossa
Pathology	Morphology	AMK books Past exam Qs Pathology Secrets	• MI/Reperfusion Injury • Aneurysm/Atherosclerosis/Dissection • Asthma/ARDS/APO/PE/COAD • Cirrhosis/Pancreatitis • Inflammatory bowel/Ischemic Bowel • Arthritis • HIV/HSV/CMV/Varicella/Measles/Hepatitis

Week 21 – Mock Exam Week
Feel free to add any weaknesses identified for targeted revision

Subject	Topics	Source material	Questions
Pharmacology		AMK books Past exam Qs	
Physiology		AMK books Past exam Qs Phys Viva book – Kerry Brandis	
Anatomy		AMK books Past exam Qs McMinn Atlas	

		Skeleton Netter Flash Cards Models	
Pathology		AMK books Past exam Qs Pathology Secrets	

Week 22

Subject	**Topics**	**Source material**	**Questions**
Pharmacology		AMK books Past exam Qs	
Physiology		AMK books Past exam Qs Phys Viva book – Kerry Brandis	
Anatomy		AMK books Past exam Qs McMinn Atlas Skeleton Netter Flash Cards Models	
Pathology		AMK books Past exam Qs Pathology Secrets	

Appendix 2

ACEM PART I PROGRAMME

Week	Pharmacology	Physiology	Anatomy	Pathology
1	Pharmacodynamics Receptors 2nd Messenger Dose response	Body Fluids	Tissues and structures.	Normal Cell Injury/Adaptations
2	Pharmacokinetics Clearance VD Half life	Nerve & Muscle Transmission AP Musc contraction NMJ	Nervous System Brain & Spinal Cord	Inflammation
3	Biotransformation Phase 1&2. CP450 +/-	Nervous System Reflex Senses	Upper Limb – pectoral girdle/axilla	Healing & Repair
4	CV Antiarrhythmic Inotropes	CVS – heart, cardiac cycle, conduction	Upper Limb – Upper Arm	Fluid & haemodynamics
5	CV Antianginal Antihypertensive	CVS – Pressure/flow/ Resistance/ Vessels	Upper Limb – Forearm	Immune System & Neoplasia
6	CV Diuretics	CVS – Control – Autoregulation Local, Neural RAA	Upper limb – Wrist/Hand	Infectious Disease
7	CV Anticoagulant Clopidogrel/Asp Heparin/warfarin TPA/Strep	CVS – CO/VR Special Circulation	Upper Limb – Neurovascular & transitional zones	Blood Vessels – Atherosclerosis Aneurysm, HT
8	Neuro –ANS SNS/PNS Atropine etc	Resp – Structure & function	Lower Limb – Ant/Post/Medial Thigh	Heart – IHD, HF, Valvular
9	Neuro GA/LA/M Relaxants	Resp – Ventilation & diffusion – regional difference	Lower Limb – Pelvis & Lateral rotators	Heart – Cardiomyopathy Pericarditis
10	Neuro - Anticonvulsants Sedatives Ethoh	Resp – Blood flow/metabolism/ Gas transport	Lower Limb - Popliteal fossa & Knee	Lungs – Asthma/COPD/ ARDS

11	Neuro – Antidepressants Antipsychotics Parkinsons	Resp – Control – periph/central chemoreceptors Altitude & exercise	Lower Limb – Lower Leg ant/post compartment	Lungs – Pneumonia/APO /PE
12	ABx Betalactam Aminoglycosides Sulphonamides	Renal GFR, RBF/RPF, clearance	Lower Limb – foot & Sole	Renal – Glomereular disease, ARF/CRF
13	ABx Quinolones Macrolides Resistance	Renal Nephron, tubule function	Lower Limb – neurovascular & transitional zones	Renal – calculi, GU disorders
14	ABx TB treatment Antivirals Antiseptics	Acid Base Buffers Renal/Resp Revision	Head & Neck Skull & Foramina + Triangles	Liver cirrhosis, hepatitis,
15	Analgesic Opiate NSAID/Steroid	Absorption & Digestion Lipids/Fats/Protei ns	Head & Neck Mouth, Pharynx, Larynx	Pancreas Pancreatitis, acute & chronic
Week	**Pharmacology**	**Physiology**	**Anatomy**	**Pathology**
16	Resp & GI Sympathomimeti c Methylxanthine AntiMuscarinics Antiemetics/PPI	GIT Structure and function	Thorax – Chest Wall, Mediastinum, Lungs	GI tract & Endo Thyroid/Adrenal s Diabetes
17	Autocoids & Endo Histamine/5HT Diabetes, Insulin Thyroid drugs	Endocrinolgy Thyroid Adrenal/pancreas Calcium/Renal	Thorax – Heart & Great Vessels	CNS Stroke, meningitis, SOL, degerative
18	Toxicology Charcoal Common OD Interactions TCA/Paracetamol / organophosphate	Metabolism Carbs/Prot/Fat	Abdo – Abdominal wall & peritoneum – Aorta/Vena Cava	MS & skin Fractures, OA/RA Haematology
19	Old Age/Pregnancy Miscellaneous	Blood Plasma/Blood groups/Lymph	Abdo – Bowel, Viscera, Ureters	Environmental Radiation/Heavy metal/pollution etc
20	MCQ & Viva practise	MCQ & Viva practise	MCQ & Viva practise	MCQ & Viva practise
21	Mock Exam MCQ & Viva practise	Mock Exam MCQ & Viva practise	Mock Exam MCQ & Viva practise	Mock Exam MCQ & Viva practise

22	MCQ & Viva practise	MCQ & Viva practise	MCQ & Viva practise	MCQ & Viva practise
23	ACEM I	ACEM I	ACEM I	ACEM I
24	Freedom	Freedom	Freedom	Freedom