REPORT OF THE
INTENSIVE CARE PRIMARY EXAMINATION

FEBRUARY/APRIL 2008

This report is prepared to provide candidates, tutors and their supervisors of training with information about the way in which the Examiners assessed the performance of candidates in the Examination. Answers provided are not model answers but guides to what was expected. Candidates should discuss the report with their tutors so that they may prepare appropriately for the future examinations.

The exam included two 2.5 hour written papers comprising of twelve short answer questions and twenty short fact questions. Candidates were required to perform at a satisfactory level in the written before being eligible to sit the oral part of the exam. The oral was comprised of eight, ten-minute Viva stations.

OVERALL STATISTICS

Total number of candidates presenting for the written examination	3
Number of candidates scoring >50% in the written	0
Number of candidates scoring 45-50% in the written	2
Total number invited to the Oral section based on written marks	2

Successful candidate: Dr Ravisubramanian Chockalingam Pillai

WRITTEN SECTION

Short Answer Paper 1

Question 1 - Describe the pharmacological effects of paracetamol. Outline its toxicity and management.

Main points expected for a pass included:

- Actions and mechanism of actions of paracetamol. These include inhibition of cylo-oxygenase (COX) activity and prevention of prostaglandin (PG) production. More marks were given for mention of a central COX 1 variant as the possible enzyme responsible for paracetamol's central versus peripheral effects. Knowledge of the central sites of action was expected.
- Outline of toxicity. Candidates were expected to demonstrate knowledge of toxic doses, conditions enhancing toxicity (alcohol intake, chronic use etc), and the mechanism of hepatic toxicity and other organ toxicity (especially renal). A detailed list of clinical features of toxicity was not required.
- Management of toxicity. Candidates performed well in this section with good knowledge of timing, toxic doses, use of paracetamol levels and the nomogram to determine whether

N-acetylcysteine should be administered. Mechanism of action of NAC was expected. Mention of monitoring (liver failure) and supportive therapy gained marks, but detailed explanations were not required

Syllabus G2e2c
Stoelting 4th edition page 285
Rand Dale 5th page 244

2 candidates (66%) passed this question.

Question 2 – Outline the differences between heparin and enoxaparin with respect to:

- **Phamacokinetics**
- **Monitoring of effect**
- **Adverse effects**
- **Reversal of effect**

Candidates were expected to mention the differences between heparin and enoxaparin and to explain why these differences existed and their implications.

For example:

heparin Pharmacokinetics -

MW3000-30000. Large variability has significant effects on:

- mechanism of action (IIa, IXa, Xa)
- dosing(2/3 molecules in dose have no active binding sites)
- bioavailability poor,T1/2 short (rapid uptake by PF4/endo cells/macrophages and proteins of high MW components) = poor predictability and dose response both IV and SC, mandates monitoring IV

T1/2 1-2 hours: S/C 2-3 daily doses. Continuous IV – advantage is fast offset.

enoxaparin -

MW3000-5000. Inhibits Xa only.

- bioavailability (100%),longer T1/2 no uptake/protein binding
- predictable activity and dose response = decreased need for monitoring, reliable SC
- No need for IV use

T1/2 4-5 hours, 1-2 daily dosing, but no fast offset.

Better answers were in tabular format under each heading. Higher marks were awarded for mentioning of monitoring pitfalls such as heparin resistance, measuring Xa levels in a timely fashion, and the efficacy and pitfalls of protamine with each agent.
Syallabus J2 2a
Reference: Stoelting 505-511
Katzung 546-548

1 candidate (33%) passed this question.

Question 3 – Describe the principles of measurement of arterial haemoglobin oxygen saturation using a pulse oximeter. Outline the limitations of this technique.

The main points expected for a pass included a brief description of the following:

- The system components
- The principles of light absorbance and the Beer-Lambert Law
- The differential absorbance of Hb species in red/infrared spectrum, and their use to calculate the amount of reduced and oxygenated Hb present
- LED emitting 660/940/off cycles at 450-900Hz, averages data over several cycles to eliminate ambient light, and detect pulsatile and non pulsatile elements
- Pulse added absorption of each cycle compared as ratio "R" at different wavelengths
- Calibration curve to compare "R" to SaO2 data from healthy volunteers
- The limitations of the technique including:
    - quality of product, bias, precision and accuracy
    - insensitivity to PaO2
    - false readings and their causes

Diagrams gained marks only with sufficient labelling and explanation.

Syllabus S2f

No candidates (0%) passed this question.

Question 4 - Describe the factors that are important when interpreting plasma drug concentrations.

The majority of the information required for this question is covered within the general pharmacology section of the syllabus. The main points expected for a pass were:

- Mention and discussion of pharmacokinetic factors such as drug absorption, volume of distribution, clearance, protein binding, dosing frequency and drug level sampling.
- Mention and discussion of pharmacodynamic factors such as drug sensitivity, and therapeutic range.
- Clinical relevance of a drug concentration (e.g. peak or trough level, total or free drug, etc).

Candidates often failed to frame their answer to the question that was asked. Candidates could have made a greater use of illustrations and examples of drugs to help answer the question.

Among other relevant listed references, candidates should seek information from within the text books - *Basic and Clinical Pharmacology* by B. G Katzung and *Pharmacology* by H. P Rang, J. M Ritter and M. M Dale.

Syllabus Pharmacokinetics 2i

No candidates (0%) passed this question.

Question 5 - Outline the physiological factors that influence cerebral blood flow.

The main points expected for a pass were:

- Description of the relationship of CO2; O2; MAP and Cerebral metabolism with cerebral blood flow. The use of graphs, correctly labelled, and associated free text would be an effective means of portraying this information.
- The effect of other factors such as intracranial pressure, cerebral venous pressure, vascular calibre, blood viscosity and regional blood flow differences.

Syllabus C1f2c

1 candidate (33%) passed this question.

Question 6 – Compare the effect on arterial blood carbon dioxide and oxygen levels of ventilation / perfusion inequalities.

The main points expected for a pass were:

- Range, regional pulmonary differences and gradients of V/Q ratios.
- Definitions of shunt (V/Q = 0) and dead space (V/Q = ∞).
- Explanation of why and how V/Q mismatch lowers arterial PaO2 (majority of pulmonary blood flow being from basal regions, shape of haemoglobin disassociation curve).
- Explanation of why and how V/Q mismatch lowers arterial PaCO2 (majority of pulmonary blood flow being from basal regions, predominately linear shape of CO2 disassociation curve within the physiological range of PaCO2 values).

Again, the use of illustrations would be very useful aids as part of a good answer.

Candidates often failed to frame their answer to the question that was asked and deviated to areas not directly sought after by the question. This resulted in wasted time and opportunities for marks.

Syllabus B1g
Reference Nunn 4th edition page 165-187

No candidates (0%) passed this question.

Question 7 - Outline the regulation of plasma calcium concentration. Outline the mechanism of action of biphosphonates for the management of hypercalcaemia.

The main points expected for a pass were:

- The components of plasma calcium are diffusible Ca (free and complexed) and non-diffusible Ca (protein bound). Only the plasma free Ca is physiologically active and regulated by homeostatic mechanisms. Plasma free Ca is also affected by plasma pH and albumin concentration.
- The distribution of Ca in the body and the fact that ECF Ca is less than 0.1% of total body Ca. ECF and hence plasma Ca is the result of a balance between dietary intake, gastrointestinal absorption and excretion, renal excretion and exchange with bone Ca.
- Tight hormonal regulation of GIT absorption, bone exchange and renal excretion mainly by parathyroid hormone and calcitriol.

Also expected were details of the actions of PTH on bone and the kidney and the actions of calcitriol on the gut and bone. No candidates described the feedback control mechanisms involving PTH and calcitriol. Additional marks were given for mention of other hormones that have a lesser effect on plasma Ca concentration.

The second part of the question on the mechanism of action of biphosphonates was poorly answered.

Syllabus N 2i

1 candidate (33%) passed this question.

Question 8 - Outline the role of the kidney in body water homeostasis.

The main concept required was that the renal excretion of water is basic to the maintenance of constant body water conditions. This renal water excretion is controlled by multiple factors that influence glomerular filtration and tubular reabsorption. Also the kidney has mechanisms that allow it to eliminate excess water by excreting a dilute urine or to conserve water by excreting a concentrated urine.

Better answers provided details of the large GFR and the renal tubular handling of water. Also the creation of the hyperosmolar medullary interstitium by the counter current multiplier system, the special characteristics of the Loop of Henle that cause solutes to be trapped in the renal medulla and the resulting delivery of a hypoosmolar tubular fluid to the collecting ducts. Finally the variation in water permeability of the collecting ducts under the influence of ADH.

Extra marks were awarded for details on ADH including its origin, secretion, regulation and mechanism of action and the concept of electrolyte free water clearance.

Some candidates confused aquaporins with vasopressin receptors. Other candidates produced long and irrelevant descriptions of the renin angiotensin system which gained no extra marks.

Syllabus D1 2f

1 candidate (33%) passed this question.

Question 9 - Describe the physiological basis for the mechanism of action of three commonly used anticonvulsant groups. Give an example of a drug for each mechanism of action.

The three main anticonvulsant mechanisms required were:

1. Sodium channel blockers. These promote the inactive state of voltage activated Na channels. Sodium channels are unable to open for a period of time making the neuron more refractory to action potential generation. Rapid repetitive firing is diminished and spread of electrical activity to adjacent brain areas is suppressed.
   Examples: phenytoin, carbamazepine, lamotrgine, Na valproate

2. Drugs that enhance GABA mediated synaptic inhibition. This increases the influx of chloride ions into the cell and hyperpolarizes the neuron. 3 mechanisms:
   a. Act on GABA receptor. Example: benzodiazepines, barbiturates.

b. Inhibit GABA transporter and reduce neuronal GABA reuptake. Example: tiagabine.
c. Promote GABA release. Example: gabapentin.

3. Drugs that inhibit Calcium channels. Limit activation of voltage activated Ca channel known as the T current. Example.: Na valproate

Other mechanisms of action with examples if described earned extra marks. These included glutamate /NMDA receptor inhibition. Example: magnesium.

Syllabus G2f

1 candidate (33%) passed this question.

Question 10 - Briefly describe the factors that influence the partial pressure of Oxygen in mixed venous blood.

The main points candidates were expected to cover included:

- A discussion of the non-linear relationship between O_2 content and partial pressure and the factors which affect this relationship. No candidate included this.
- Modification of the Fick equation as it relates mixed-venous oxygen to delivery and consumption.
- The components of delivery should have been described and use of the O_2 flux equation would have been helpful. Additional marks were available for describing how these might change in physiological and pathological states.

Candidates frequently interchanged content and partial pressure, without clearly displaying how these are related. Normal values were not provided. The O_2 flux equation, when included, was often written incorrectly. No consideration was given to normal variations, such as pregnancy or exercise

Reference: Nunn 5^{th} edition pages 267 to 269, page 493
Syllabus: B1h Gas transport in the blood 2a

1 candidate (33%) passed this question.

Question 11 – List the physiological factors that increase respiratory rate. Include an explanation of the mechanism by which each achieves this increase.

The main points candidates were expected to cover included:

- A description of the central and peripheral chemoreceptors, their predominant stimuli and effect on ventilation.
- $PaCO_2$ as the main influence on normal ventilation, the near-linear relationship to minute ventilation around the normal range, and how CO_2 produces this effect.
- PaO_2 and pH and their sites of action.
- Other stimuli to ventilation – exercise, pregnancy, temperature, baroreceptors.

Candidates frequently confused central and peripheral receptor activities and failed to provide any relative significance to the major factor(s). The use of a graph relating the main factors to minute ventilation would have been helpful.

Syllabus B1c 1
Reference: Nunn 6th edition 60-68
Kam 1st edition 92-98

No candidates (0%) passed this question.

Question 12 – Classify the commonly used inotropic agents and list their mechanisms of action.

Candidates could use a number of different classifications, however, were required to include all of the major groups of agents. Most made some mention of the sympathomimetics, however failed to sub-classify these, or confused catecols versus non-catecols, or naturally occurring versus synthetic agents. Other agents, such as phosphodiesterase inhibitors, calcium sensitisers, cardiac glycosides, or calcium itself received minimal attention.

Mechanisms of action required more than listing adrenergic receptor types. Some listing or discussion of the sub-cellular mechanisms was necessary. Comment about intracellular calcium being the final common end-point would have scored additional marks

Syllabus C2d 2
Reference: Stoelting 4th edition 293-320
Katzung 10th edition 121- 198
Rang and Dale 6th edition 168-187 290-291

No candidates (0%) passed this question.

Short Answer Paper 2

Question 1 - Describe the relationship between creatinine clearance and serum creatinine concentrations. What are the potential pitfalls in using serum creatinine concentrations to assess renal function in a critically ill patient in ICU?

It was expected candidates would describe that both these are surrogate measures for Glomerular filtration rate. Credit was given for clear definitions, formula and normal values (such as plasma clearance is the volume of plasma cleared per unit time). It was expected candidates could explain that serum creatinine results from a balance of creatinine produced and excreted and hence the slow response time and limitations for its use because of changes in both production and excretion.

Extra credit was given for appreciating the non linear relationship between changes in serum creatinine and creatinine clearance and that significant changes in glomerular filtration can occur before this is reflected in the serum creatinine. Comment on the problems of dilution with acute changes in fluid balance and that tubular secretion of creatinine can occur when the serum creatinine concentration is high both gained extra marks.

Syllabus D1 2
Reference Ganong 22nd edition 699-728

No candidates (0%) passed this question.

Question 2 - Define the terms antiseptic and disinfectant. Briefly describe the advantages and disadvantages of alcohol, chlorhexidine, glutaraldehyde and povidone iodine.

It was expected candidates could define and distinguish between these terms with a specific comment that disinfectants are applied to inanimate objects and antiseptics can be applied to living tissue. The advantages and disadvantages could be addressed either tabulated or discussed in point form, either was acceptable.

It was expected answers would include a comment on each agent and specifically address areas such as general spectrum of activity, speed of onset (agents that need to dry to be effective versus those with more rapid onset), duration of effect (residual activity), limitations of use and potential hazards. Marks were awarded for identifying Glutaraldehyde as a disinfectant (as opposed to the other antiseptic agents) and its use for cleaning equipment such as endoscopes with the precautions required for potential toxicity.

Additional credit was given for discussion of relevant facts such as the proven benefit for chlorhexidine skin preparation for central venous line insertion. Candidates are referred to several of the recommended texts which cover this area well.

Syllabus M2 2f
References: Katzung 10th edition 821-823
Stoelting 640-642
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No candidates (0%) passed this question.

Question 3 - Compare and contrast the pharmacology of sodium nitroprusside and glyceryl trinitrate for the treatment of acute hypertension.

It was expected candidates would address specific aspects of pharmacology such as action, mechanism of action, half life and duration of effect, route of administration, potential toxicity and special precautions. These agents lend themselves to comparison and contrast as several distinct similarities and differences exist and credit was given for highlighting these. Specific comments should include that both agents result in blood vessel dilation with extra credit given for detailing the differences in the balance of arterial versus venous effects between them. For both agents the effect is mediated through nitric oxide and it was expected candidates would identify that nitroprusside releases NO spontaneously and GTN requires enzymatic degradation with the resultant effects on smooth muscle mediated via c GMP. They are both short acting agents when used intravenously and require careful titration to measured blood pressure for effect.

Extra credit was given for mentioning that routes other than IV are available for GTN (topical / oral) but not for nitroprusside. Comments on special precautions such as Nitroprusside should be protected from light and GTN given via non PVC giving sets gained additional marks. In addition to the well described adverse effects of each agent, it was expected candidates would mention the potential for cyanide toxicity with nitroprusside and extra marks were awarded for an indication of usual doses.

Syllabus C2b 2e
References Katzung 10th edition SNP 173-174 GTN 185-189)
Stoelting 355-365

2 candidates (66%) passed this question.

Question 4 - Describe the blood-supply to the liver.

A correct description of the vascular anatomy; the contribution and composition of hepatic artery and portal vein flow to total hepatic flow and how this is regulated would be awarded with a pass. An answer that expanded on these main points received additional marks. The interdependence of hepatic artery and portal vein flow was not appreciated by any candidate.

Either candidates knew the answer to this question or they did not. Some candidate(s) tried to guess at what the anatomy might be. This attracted no marks. Many candidates lacked sufficient knowledge to pass this question.

Syllabus I 2 d&g

No candidates (0%) passed this question.

Question 5 - Describe the role of the kidney in drug excretion, and the factors affecting this. Briefly outline how you would alter the dosing of gentamicin in a patient with renal impairment.

The main points candidates were expected to cover included a brief definition of renal clearance followed by a description of the drug factors that affect this (filtration, secretion and reabsorption), recognition that GFR and protein binding was important in the answer. A brief description of gentamicin kinetics that affect dosing regimens and a statement that dosing would be guided by calculated GFR and measured drug levels would round out a good answer. Correct elaboration of the above factors was rewarded with additional marks.

Candidates failing this question submitted answers where concepts were randomly mentioned with no attempt to integrate these into a cohesive answer that demonstrated an understanding of the topic. Writing random words without examples or explanations did not demonstrate sufficient understanding to be rewarded with marks. Again, many answers lacked sufficient detail in the answer.

Syllabus- Pharmacokinetics

No candidates (0%) passed this question.

Question 6 - Compare and contrast the pharmacology of drugs that change the pH of gastric fluid.

The main points candidates were expected to mention were the major drug groups (antacids, H2 antagonists, proton pump blockers), describe their mechanism of action; briefly mention relevant pharmacokinetics and then briefly discuss the potential problems and interactions when using them. Additional credit was given for answers providing more detail.

Many answers did not mention antacids or prostaglandin analogues, choosing only to discuss H2 receptor blockers and proton pump blockers. Even then, many answers included incorrect pharmacokinetic data. Drug interactions were rarely mentioned. A discussion of normal gastric acid secretion was not asked for and was not rewarded with marks.

Syllabus Q2a

1 candidate (33%) passed this question.

Question 7 - Outline normal impulse generation and conduction in the heart. Describe the features present in a normal heart that prevent generation and conduction of arrhythmias.

This question required description of the SA node, its primary role and generation of the pacemaker potential and the influence of the autonomic nervous system. A diagram of the conducting pathways, highlighting specialized tissues with fast or slow conduction velocities would have been appropriate. The importance of the AV node in preventing retrograde conduction and high rates conducted to the ventricles (>220 / min) was often neglected in answers. A discussion of the Purkinje Fibres with particular reference to the absolute and relative refractory periods was essential.

Additional marks were awarded for mention of the atrial internodal pathways, conduction within the ventricles from the endocardial to epicardial surfaces and the significance of the compensatory pause in response to ectopic beats.

Syllabus C1b 2.a, b;
Reference: *Cardiovascular Physiology*, "Electrical Activity of the Heart" (Chapter 2), Berne and Levy.

1 candidate (33%) passed this question.

Question 8 - What are the strengths and weaknesses of the randomised control trial study design?

This question would best be answered by listing the relative merits and drawbacks of the study design, with elaboration on the subjects of treatment allocation, randomisation to eliminate selection bias, the need for adequate sample size to achieve power and a discussion of the logistics of conducting multi-centre trials. Additional marks were awarded for discussion of blinding, prospective design, "efficacy versus effectiveness" trials, applicability and ethical considerations. The need for "equipoise" as a pre-requisite for randomisation in a clinical trial was not discussed by candidates. Definition of Type I and Type II errors and the relative merits of this study design in avoiding these errors required more detailed discussion.

Syllabus EBM 2.b, d, e;
Referrence: *Statistical Methods for Anaesthesia and Intensive Care* (Chapter 4), Myles and Gin.

1 candidate (33%) passed this question.

Question 9 - Explain the ABO blood groups and how blood group is determined. How is blood tested for compatibility using the ABO system?

The main points candidates were expected to cover included a detailed discussion of the ABO antigens, the evolution of IgM antibodies to these antigens and the prevalence of blood groups in the general population. Answers tabulating blood groups against expected antigens and antibodies present as well as agglutination reactions to anti-sera were most effective. Discussion of the saline agglutination test was essential and extra marks were awarded for

mention of the Coombs test. Candidates were required to demonstrate an understanding of cross-matching, specifically the testing of donor red blood cells against recipient serum.

Syllabus J1 2.a
References: *Review of Medical Physiology* (Chapter 27), 22nd ed.
Ganong, pp. 537-539.

1 candidate (33%) passed this question.

Question 10 - Outline the factors influencing the transport of drugs across the placenta.

The main points candidates were expected to know included the passive and active mechanisms that regulate the transfer of drugs across placenta and the potential clinical implications of drugs use in pregnancy in order to pass this question .

Good answers to this question included examples to all the possible mechanisms that can affect the transport of drugs across placenta.

The common omissions were degree of ionisation, active transporters, placental metabolism, explanation on the interaction between protein binding and ionisation of a drug in regulating placenta transfer, and the expected molecular size or weight of a drug that affects passive placental transfer of the drug.

Syllabus O2d and O2e

No candidates (0%) passed this question.

Question 11 – Describe the hormonal response to hypovolaemia following the acute loss of one litre of blood in an adult. Include changes that occur in the first 24 hours following the blood loss.

Candidates were expected to know the different hormonal responses to hypovolaemia The possible approach to this question can be either by explaining the hormonal response in terms of time sequence or by different hormonal systems.

Good answers to this question included how different hormonal responses are activated and mediated.

The common omissions were secretion of erythropoietin within 24 hours of haemorrhage, role of macula densa and juxtaglomercular apparatus, interactions between baroreceptors and sympathetic nervous system with the secretion of ADH, cortisol, glucagon and catecholamines.

Syllabus: C1g 2b
Reference: Kam 1st edition 156, 212
Guyton 11th edition 342,287-280

2 candidates (66%) passed this question.

Question 12 - Draw and label a left ventricular pressure volume loop in a normal adult. List the information that can be obtained from this loop.

Candidates were expected to draw and label a diagram showing the relationship between pressure and volume during the different phases of the left ventricular contraction and relaxation (or systole and diastole)

Good answers to this question consisted of a well-labelled graph with appropriate scale on both x and y-axes showing all the important events during systole and diastole of the left ventricle.

The common omissions were rapid and slow ejection phase during systole, when aortic valve closes, stroke volume, ejection fraction, end-systolic pressure volume line showing the contractility of the left ventricle.

Some candidates appeared to have confusion about which line shows contractility and which line shows left ventricular after load.

Syllabus C1c
Reference: Kam 1st edition 115-121
Guyton 11th edition 110

2 candidates (66%) passed this question.

ORAL SECTION

2 candidates were invited to attend the oral section based on their written marks.

Viva 1 - You are considering starting a patient on captopril. Discuss the pharmacology of this drug.

Candidates were expected to discuss administration, bioavailability, metabolism, excretion and half life of captopril. Candidates were then asked to compare it to the longer acting ACE inhibitors and discuss their advantages and/or disadvantages in ICU patients.

The Viva then explored the candidate's knowledge of dosing intervals, plasma concentration times curves and effect time curves in relation to ACE inhibitors. Candidates were expected to know why these curves differed, (avid enzyme binding), and thus why the dosing intervals for ACE inhibitors are so long in relation to their half lives. The concepts of Emax, EC50 and Therapeutic index were required.

Candidates were then asked to discuss the mechanism of action of ACE inhibitors and their cardiovascular, endocrine, renal and CNS effects. Drug interactions and adverse effects were expected knowledge.

Syllabus, General Pharmacology I and II, ACE inhibitors, C2b2f.
References : Katzung B.G.'s 'Basic and Clinical Pharmacology'
Brunton L.L. Goodman and Gilman's 'The pharmacological basis of Therapeutics'.

1 candidate (50%) passed this question.

Viva 2 - Outline the distribution of total body water.

In order to pass this viva, candidates were expected to know the distribution of water in different body compartments, the difference in electrolytes composition in different compartments (E1), definition of osmosis and diffusion, and where osmosis and diffusion occurs in the body (B1f and D1), measurement and calculation of osmolality (E1), and how different intravenous fluids will be distributed in different body compartments (E2a).

The common deficiency in the candidates' answers included the difference in electrolytes composition between interstitial fluid and plasma and the reason behind it (F2a), how osmolality can be measured, the presence of an osmotic process in the medulla of the kidney where re-absorption of water occurs through the collecting tubules in the presence of anti-diuretic hormone (D1), and how the fluids will be distributed in the body when different intravenous fluids are administered.

Syllabus : E1 2
References : Chapter 1 of *Review of Medical Physiology* by Ganong
Vander's *Renal Physiology* for details on this topic.

1 candidate (50%) passed this question.

Viva 3 - Describe the physiology of pain with respect to its mediators and pathways.

Candidates were expected to provide a definition for pain, discuss the pathways involved in the transmission of pain signals, and list the common mediators. Additional questions related to sensitisation (peripheral and central) and the Gate Control theory (G2c).

Candidates were also asked to compare the pharmacology of local anaesthetics with particular reference to lignocaine and bupivacaine (G2b). As with any question related to pharmacology, candidates were expected to discuss factors listed under "General Pharmacology" in the syllabus:

"An understanding of the pharmacology of a drug implies an understanding of the relevant pharmaceutics, pharmacokinetics (including dosage), and pharmacodynamics (including adverse effects and drug interactions)."

Candidates were asked to list the different potential modes of administration of local anaesthetic agents (G2c).

Candidates were also asked to describe the anatomy relevant to the insertion of a lumbar epidural catheter (G1:2j).

Syllabus : G2c, G2b, G1:2j

No candidates (0%) passed this question.

Viva 4 – How are bacteria classified?

Classification of bacteria. Answers included shape, staining, atmosphere and presence and position of spores.

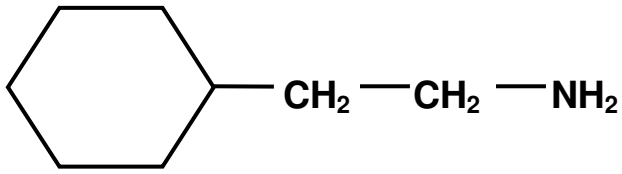
Mechanism of antibiotic action. Answers included inhibition of cell wall synthesis and interruption of mRNA/DNA

Mechanisms of antibiotic resistance. Answers included production of beta lactamase, impermeable cell wall and developing alternative metabolic pathways.

Syllabus M2a
Reference: *Medical Microbiology and Infection at a Glance*; Gillespie and Bamford, pp. 8-21.

2 candidates (100%) passed this question.

Viva 5 - Name this molecule? How can we make this molecule biologically active?



Candidates were expected to recognise 'phenylethylamine' and appreciate that it is the precursor molecule for the naturally occurring catecholamines. A brief overview of its structure activity relationships, particularly with respect to substitutions on the phenyl ring, β carbon and amine group (producing dopamine, adrenaline and noradrenaline) was expected.

Questioning then progressed to discuss the pharmacology of noradrenaline in more detail.

Changing questions, candidates were asked to provide a very brief overview of what the autonomic nervous system was before exploring the physiology of the valsalva manoeuvre in some detail.

Syllabus: G3a2d, G3a2b and G3a1

2 candidates (100%) passed this question.

Viva 6 - An 18 year old female has presented with weakness and dehydration following a period of prolonged vomiting. An arterial blood gas analysis was performed on room air, revealing the following findings.

pH	**7.59**	**(7.35 – 7.45)**
$PaCO_2$	**58 mmHg**	**(35 – 45)**
PaO_2	**72 mmHg**	**(90 – 110)**
HCO_3^-	**59 mmol/L**	**(22 – 32)**

Interpret the findings.

This viva tested the candidate's knowledge of renal physiology related to the control of urinary pH, effects of acetazolamide and frusemide upon metabolic acid base state and respiratory response to metabolic acid base changes.

The main points expected for a pass were knowledge of :

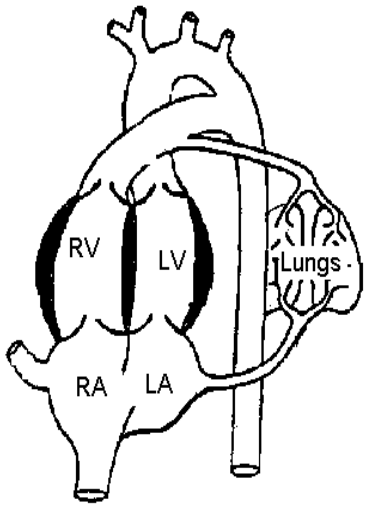
- Respiratory response to changes in metabolic acid base. Use of correctly labelled graph or common formulae
- Renal handling of H+ at the proximal and distal tubules.
- Mechanism of HCO3- reabsorption and regeneration
- Urinary buffers such as phosphate, ammonia and glutamine
- Mechanism of frusemide associated metabolic alkalosis
- Affect of acetazolamide on HCO3-

The use of illustrations greatly assisted candidates to answer questions within this viva

Syllabus : D1-2e, D2a and B1c-2a & b
Reference : *Textbook of Medical Physiology* by A. C Guyton & J. E Hall.

1 candidate (50%) passed this question.

Viva 7 - Identify the features on this diagram of the foetal circulation.



Candidates were expected to identify the major features on a diagram of the foetal circulation. Additional questions concerned the changes to this that occur with birth (Syllabus section P and O1), the haemoglobin oxygen dissociation curve (B1 h), the factors that impact on this and the significance of these changes.

Syllabus : P, O1, B1h

2 candidates (100%) passed this question.

Viva 8 - What equipment do you require to measure cardiac output via thermodilution techniques?

An understanding of the principles of monitoring in clinical practice including the evaluation of the accuracy, reliability, convenience and hazards of methods of monitoring (S 1) was the subject of this viva.

This question required candidates to describe the components of a thermodilution cardiac output catheter system (R 2.e) and invasive blood pressure transducer (R 2.d). Detailed knowledge of the physics of accurately reproducing biological waveforms, including discussion of natural resonant frequency and damping co-efficient was essential.

Understanding of the sources of error such as zeroing, baseline drift, suboptimal damping and performance of a "flush test" was assessed (C1h 2.b, S 2.b). Candidates were expected to discuss the Fick Equation and the Stewart-Hamilton Equation related to cardiac output measurement by the indicator method (C1h 2.c, S 2.c). Better answers incorporated a labelled diagram of the thermodilution curve. Additional marks were awarded for a discussion of the sources of error in cardiac output measurement, computation constant and potential complications of pulmonary artery catheterisation.

Syllabus: S 1, R 2.e, R 2.d, C1h 2.b, S 2.b, C1h 2.c, S 2.c

2 candidates (100%) passed this question.

A detailed syllabus has been developed and forms the foundation for the knowledge base for the JFIC Primary Examination. All questions are sourced directly from that syllabus and candidates should have a sound understanding of those topics, and confidence to express their understanding of the subject material in both written and oral form. The candidates should also be able to integrate and express the general basic, and the topic specific, physiological and pharmacological principles detailed within the syllabus.

Dr Gillian Bishop
Chair

Dr Arthas Flabouris
Deputy Chair

Primary Examination

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