COLLEGE OF INTENSIVE CARE MEDICINE
OF AUSTRALIA AND NEW ZEALAND

REPORT OF THE
INTENSIVE CARE FIRST PART EXAMINATION

FEBRUARY / APRIL 2017

This report is prepared to provide candidates, tutors and their Supervisors of Training with information about 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, each 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 present for 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:	57
Number of candidates scoring > 50% in the written:	31
Number of candidates scoring 45 – 50% in the written:	12
Number of candidates carrying a written score:	0
Total number invited to the Oral section based on written marks:	43
Total number of candidates successful at the CICM First Part Exam:	37

SUCCESSFUL CANDIDATES

Dr Derick Adigbli
Dr Cameron Anderson
Dr Madhuri Anupindi
Dr Marija Apostoloska
Dr Emma Barnes
Dr Cheau Wern Chin
Dr Joanna Wai Yinn Chow
Dr Edward de'Lisle-Tarr
Dr Nikhil Gautam
Dr Benjamin Angus Gladwin
Dr Stephanie Judge
Dr Edward Kauss
Dr Aaron Kennedy
Dr Fiona Kilpatrick
Dr Nikhil Kumar
Dr Sandy Kyaw
Dr Mervyn Chee Wei Leong
Dr Natasha Mansell
Dr Ronan McKeague
Dr Richard Mooney
Dr Khairil Asyraf Bin Musa
Dr Andrea Odelli
Dr Prakkash Parangi Ananthan
Dr Robert Paul
Dr Yannick Planche
Dr Jack Purcell
Dr Moon Hae Pyo
Dr Benjamin Ryan
Dr Anthony Ryan
Dr Ken Sakurai
Dr Amy Cristina Sanguesa
Dr Vikram Shah
Dr Kalpana Sharma
Dr Tae Seon Shin
Dr Jack Simpson
Dr Oliver Mark Walsh
Dr Victoria Yan Ying

WRITTEN SECTION

EXAMINERS' COMMENTS

Candidates are reminded that all questions are worth equal marks and so time should be apportioned accordingly. On occasions some questions were not attempted and this denies the candidate an opportunity to gain valuable marks.

Questions from previous examinations may be repeated and candidates are encouraged to review prior papers and examination reports.

Some answers failed to appreciate key concepts and in particular often lacked the depth expected. Candidates are expected to have a detailed knowledge and depth of understanding of level I topics such as cardiovascular and respiratory physiology. As a guide, the level of detail expected goes beyond that often outlined in a general physiology textbook and candidates are strongly encouraged to read widely so as to gain high level understanding. Some candidates scored full marks in some questions illustrating it is possible. Candidates are reminded to ensure writing is legible. If the examiner cannot read the writing, the candidate cannot be awarded marks.

SHORT ANSWER QUESTIONS – PAPERS 1 AND 2

1. Outline the anatomy and physiology of the parasympathetic nervous system.

32% of candidates passed this question.

An efficient way to answer this question was to describe the anatomy and physiology of both cranial and sacral sections together. High scoring answers included an outline of the relevant nerves, the various ganglia, neurotransmitters and physiological effects. Some candidates described the cellular basis of Nicotinic, Muscarinic and M1-M5 receptors which didn't attract marks.

2. Outline the components of dietary fat (20% of marks). Describe their possible metabolic fates (80% of marks).

21% of candidates passed this question.

Almost all candidates interpreted "metabolic fate" to mean absorption, digestion and transport of fat. Hence a lot of time was spent on this and little on the fate of fat once it enters the blood stream. The processes of neither beta oxidation, nor lipogenesis were not well understood. Ketone body production was better understood.

3. Classify and describe the mechanisms of drug interactions with examples.

44% of candidates passed this question.

Candidates with a well organised answer scored highly. A list of drug interactions was not sufficient to pass, as the question asked to 'describe' the mechanism of drug interactions. Some candidates described the interaction but did not give examples. Common mistakes

included using incorrect examples for a particular mechanism and describing the mechanism of action of drugs instead of drug interactions.

4. Describe the endocrine functions of the kidney.

39% of candidates passed this question.

It was expected that candidates would discuss the major hormones produced (or activated) by the kidney. These included erythropoeitin, renin and calcitriol. Good answers included the following: the area where the hormone is produced or modified; stimuli for release; factors which inhibit release; and the subsequent actions / effects. Marks were not awarded for hormones that act on the kidney.

5. Describe the regulation of plasma calcium concentration.

51% of candidates passed this question.

High scoring answers discussed the three major hormones involved in calcium regulation - parathyroid hormone, vitamin D and calcitonin. For each of these it was expected that candidates include: site of production, stimulus for release, inhibitory factors and actions. In the case of renin it was expected that candidates also include the actions of angiotensin and aldosterone. Very few answers discussed inhibitory factors or negative feedback loops.

6. Explain the meaning of the components of a Forest plot. (Image removed.)

65% of candidates passed this question.

To score full marks candidates needed to describe each feature of the forest plot provided. This included: odds ratio on the x axis; line of no effect; individual studies on the y axis; point estimate for each study (box position); weighting of the study (box size); pooled effect estimate (diamond position); size of the diamond; and the 95% confidence intervals and their interpretation.

7. Compare and contrast the systemic circulation with the pulmonary circulation.

26% of candidates passed this question.

This question encompasses a wide area of cardiovascular physiology. As a compare and contrast question this question was well answered by candidates who used a table with relevant headings. Comprehensive answers included: anatomy, blood volume, blood flow, blood pressure, circulatory resistance, circulatory regulation, regional distribution of blood flow, response to hypoxia, gas exchange function, metabolic and synthetic functions, role in acid base homeostasis and filter and reservoir functions.

A frequent cause for missing marks was writing about each circulation separately but comparing. For example: many candidates stated 'hypoxic pulmonary vasoconstriction', but did not contrast this to 'hypoxic vasodilation' for the systemic circulation. Frequently functions of the circulations were limited to gas transport / exchange.

8. Describe the physiological consequences of decreasing the functional residual capacity (FRC) in an adult by 1 litre.

70% of candidates passed this question.

High scoring answers began with a definition and normal values, followed by a detailed list of the consequences of decreasing the FRC.

Some candidates included descriptions of the normal function of FRC, conditions that decrease FRC and ways of improving reduced FRC. These were not required and did not attract marks. Diagrams require correctly labelled axes, values & units.

9. Outline how the following tests assess coagulation:

- **a. Prothombin Time (PT)**
- **b. Activated Partial Thromboplastin Time (APTT)**
- **c. Activated Clotting Time (ACT)**
- **d. Thromboelastography (TEG or ROTEM)**

61% of candidates passed this question.

Many candidates incorrectly stated that the PT assessed the intrinsic system and that the APTT assessed the extrinsic system. This led to subsequent errors in relating a coagulation test to the appropriate coagulation factors that it assessed. Some candidates produced elaborate diagrams of the coagulation cascade in isolation without relating it to the question.

10. Describe the pharmacology of hydrocortisone.

54% of candidates passed this question.

Hydrocortisone is listed as a Class A drug in the syllabus and as such knowledge of its pharmacokinetics is expected. No marks were awarded for generic pharmacokinetic statements such as: "average bioavailability", "moderate protein binding", "bioavailability 100% for IV preparation" etc.

11. Outline the anatomical relations of the trachea relevant to performing a percutaneous tracheostomy.

44% of candidates passed this question.

Many candidates described how to perform a tracheostomy or the structure of the trachea rather than the relevant anatomical relations. It was expected that answers include anterior, posterior and lateral relations at the correct tracheal level including relevant vascular structures.

12. Describe the pharmacology of oxycodone.

53% of candidates passed this question.

Few candidates covered the pharmacokinetic aspect of the question sufficiently.

No marks were awarded for generic comments such as hepatic metabolism and renal excretion.

13. Outline the anatomy relevant to the insertion of a Dorsalis Pedis arterial cannula (50% of marks). Explain the differences between blood pressure measurement at this site compared to measurement at the aortic arch (50% of marks).

30% of candidates passed this question.

The anatomy component of answers frequently lacked required detail. Many candidates listed the observed differences in the waveforms however an explanation for these differences was required.

14. Define respiratory compliance (20% of marks). Describe the factors that affect it (80% of marks).

54% of candidates passed this question.

This question was generally well answered with good structure.

15. Outline the cardiovascular changes associated with morbid obesity.

42% of candidates passed this question.

Many candidates did not include enough detail in their answers.

Higher scoring answers included more depth such as the following: blood volume, left ventricular changes, arterial blood pressure, pulmonary artery pressures, risks of ischaemia, arrhythmias etc.

16. List the potential problems resulting from blood transfusion and methods used to minimise them.

53% of candidates passed this question.

This question required a broad answer. It was generally well answered. Those candidates who scored well had a good structure to their answers e.g. grouping potential electrolyte disturbances together, and infectious risks together etc. and including methods used to minimise these risks in appropriate detail.

17. Compare and contrast the pharmacology of phenytoin and levetiracetam.

35% of candidates passed this question.

A table was useful to answer this question. Comparing and contrasting the pharmacology was required to score well rather than listing various aspects of pharmacology. The key properties of the drugs which demonstrate their importance to ICU was required.

18. Outline the functional anatomy of the kidneys (40% of marks). Outline the regulation of renal blood flow (60% of marks).

67% of candidates passed this question.

Candidates who scored well weighted their answers according to the marks allocation outlined in the question and adopted a good structure. A number of candidates confused the roles of tubuloglomerular feedback and the renin angiotensin aldosterone pathway.

19. Define mixed venous PO_2 (20% of marks). Outline the factors that affect this value (80% of marks).

37% of candidates passed this question.

This question was in two parts – the first part was worth 20% and candidates were expected to provide a definition of mixed venous blood as well as the partial pressure of oxygen in mixed venous blood (including normal range). Good answers also provided the varying PO_2 from different tissue beds that make up mixed venous blood, where the 'mixing' occurs (the right ventricle) and where it is sampled (pulmonary artery).

For the second part of the question, worth 80% of the marks, good answers included the relationship between mixed venous PO_2 and mixed venous O_2 content (including the shape and position of the HbO_2 dissociation curve); the variables encompassed in the modified Fick equation; arterial oxygen content and its determinants; oxygen consumption (VO_2); and cardiac output (CO). Including an outline of how each affects the value of mixed venous PO_2.

A number of candidates wrote about mixed venous oxygen *saturation*. Other common errors were: missing a number of key factors that affect PO_2; and using an incorrect form and/or content of the modified Fick equation.

20. Describe the pharmacology of vasopressin (70% of marks) and its analogues (30% of marks).

28% of candidates passed this question.

A pharmacology answer template outlining pharmacokinetics and dynamics was required. Candidates failed to score marks for describing the physiology of vasopressin secretion. A number of answers demonstrated limited knowledge about its indications for use and its potential adverse effects.

21. Explain the potential causes of a difference between the measured end tidal CO_2 and the arterial partial pressure of CO_2.

30% of candidates passed this question.

Many candidates didn't distinguish between the different types of dead space. In general this topic was not well understood.

22. Outline the functions of the liver.

56% of candidates passed this question.

Most candidates attempted a structure however did not expand the answers within the categories: e.g. a passing mention of glucose homeostasis is insufficient to score full marks for the carbohydrate metabolism category.

23. Draw and label a left ventricular pressure volume loop in a normal adult (40% of marks). List the information that can be obtained from this loop (60% of marks).

65% of candidates passed this question.

Many candidates lost marks for poor quality diagrams with inaccurate labelling. An accurate diagram was required. Many answers lacked sufficient detail regarding contractility and afterload.

24. Outline the physiology of cerebral spinal fluid (CSF).

67% of candidates passed this question.

Better answers included details on CSF production (amount, site), reabsorption and factors which influences CSF and its circulation.

SHORT FACT QUESTIONS – PAPERS 1 AND 2

93% of candidates passed this section:

Cloze Questions	88% pass rate
Rank Questions	81% pass rate
Match Questions	95% pass rate

The Short Fact Questions were generally well answered. There were a few common gaps in knowledge; specifically, ROC curves, the Valsalva manoeuvre and the location of the match respiratory centres.

ORAL SECTION

DAY 1

VIVA 1

This viva will examine your understanding of the control of ventilation.

Describe the physiological reasons for an increased respiratory rate and the mechanism by which these occur.

82% of candidates passed this question.

VIVA 2

This viva will explore your knowledge of blood groups and coagulation.

Describe blood groups.

86% of candidates passed this question.

VIVA 3

This viva will examine myocardial performance, lusitropy and blood pressure regulation.

How is blood pressure regulated acutely?

91% of candidates passed this question.

VIVA 4

This viva will examine the classification of bacteria.

What is illustrated in this picture?

(Image removed.)

95% of candidates passed this question.

VIVA 5

This viva will examine cardiac physiology and measurement.

Using the diagram provided, draw and label the cardiac conduction pathway.

(Image removed.)

86% of candidates passed this question.

VIVA 6

This viva will examine your knowledge of cerebral perfusion, its control and measurement.

What is a normal cerebral blood flow and how is this distributed?

86% of candidates passed this question.

VIVA 7

This viva will assess your understanding of the gas laws.

Describe the composition of gas found at points A, B and C.

(Image removed.)

77% of candidates passed this question.

VIVA 8

This viva will test your understanding of lung volumes.

Describe this graph of lung volumes.

(Image removed.)

91% of candidates passed this question.

DAY 2

VIVA 1

This viva will examine some physiological causes of polyuria.

A patient has been weaned from several days of positive pressure ventilation and extubated. Over the next 5 hours she becomes polyuric.

Explain the physiological reasons for this.

67% of candidates passed this question.

VIVA 2

This viva is about carbon dioxide.

What are the features of a capnograph?

(Image removed.)

95% of candidates passed this question.

VIVA 3

This viva will examine the pharmacology of propofol and ketamine.

What is the mechanism of action of propofol?

100% of candidates passed this question.

VIVA 4

This viva will examine acid/base physiology.

What is the Henderson–Hasselbalch equation?

95% of candidates passed this question.

VIVA 5

What is the cardiovascular response to a rapid and sudden loss of 1000 mls of blood?

71% of candidates passed this question.

VIVA 6

This viva will test your knowledge of anatomy and physiology related to central venous pressure.

Identify the structures on the diagram below.

Which nerve is anatomically associated with structures 2 and 7?

(Image removed.)

90% of candidates passed this question.

VIVA 7

This viva will test your knowledge of the neuromuscular junction and of assessment of neuromuscular blockade.

Name the structures marked on the diagram at A, B, C and D.

(Image removed.)

43% of candidates passed this question.

VIVA 8

This viva will test your understanding of the oxygen cascade.

Describe the oxygen cascade.

(Image removed.)

100% of candidates passed this question.

SUMMARY OF THE EXAMINATION

The CICM First Part Examination explores the knowledge of the basic sciences that form the basis to Intensive Care practice. A detailed syllabus has been developed and clearly sets out the Level of Understanding expected for each listed topic and drug. It is important that Candidates follow the Syllabus in its entirety. All questions are sourced from the Syllabus and the recommended texts are a guide to study. Some sections will require more extensive research and the use of other textbooks.

Candidates are expected to attain a level of knowledge that goes beyond just the listing of pure facts but to also be able to explain, describe, collate and synthesize that knowledge across different scenarios as they apply to intensive care practice. Sufficient depth of understanding and a structured approach to topics continues to remain an area of weakness for many candidates.

This is a challenging exam. Candidates must allow sufficient time to prepare (typically approximately 12 months to study). Candidates are strongly encouraged to discuss their level of preparedness, and to trial written and oral questions, with their Supervisor of Training and other CICM Fellows, prior to undertaking the CICM First Part Examination. The examination reports are available as a guide to areas that are covered but do not provide model answers and should be read as such.

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May 2017