COLLEGE OF INTENSIVE CARE MEDICINE
OF AUSTRALIA AND NEW ZEALAND

Report for the First Part Examination of the Basic Sciences for Intensive Care Medicine

February/April 2026

The First Part Examination of the Basic Sciences for Intensive Care Medicine involves both a written and oral examinations. The written component comprised two 2.5-hour papers, each paper contained 50 multiple-choice single best answer questions (MCQ) and ten short answer questions (SAQ). The written paper pass mark is determined using the Angoff method. The oral component comprised eight ten-minute cross table VIVAs. The pass mark for the VIVAs is determined by borderline regression, the performance of candidates scoring one standard error below the borderline regression pass mark are individually reviewed by the examiner court to assess whether they had met the passing standard. This standard considers their performance on individual VIVAs with particular focus on the stations covering the core syllabus as outlined in the T-17 – Notes for Candidates for the First Part Examination.

This report is prepared to provide candidates, educators and supervisors of training with information about the First Part Examination. The report acts as a guide providing a summary of the results of the 2026.1 exam and general feedback from examiners. The feedback provided for the short answer questions either outline a brief overview of a structure that would comprise a comprehensive answer or indicate common reasons why candidates were not successful in scoring higher in their answers. For unsuccessful candidates and their supervisors this report should be used along with individual feedback letters to guide preparation for future attempts.

SUMMARY OF 2026.1 EXAM RESULTS

Total number of candidates presenting for the written examination: 83
Number of candidates successful in the multiple-choice questions: 61 (73%)
Number of candidates successful in the short answer questions: 47 (57%)
Number of candidates successful in BOTH written components and receiving an invitation to the oral component: 43 (52%)
Number of candidates carrying a written pass from previous examinations: 9
Total number invited to the oral component: 52
Total number of candidates successful at the 2026.1 CICM First Part Exam: 42 (81%)

WRITTEN EXAMINATION

General Comments

The written exam requires detailed knowledge and understanding of the entire syllabus. The question wording determines the breadth of your answer. The level of detail required is indicated by the terminology of the question ie. Outline vs Describe and the level of detail that is reasonably achievable within 10 minutes. Much care is taken in the specific wording and breakdown of each question to help guide candidates with the information expected. Candidates should refer to the Glossary of Terms provided in the exam to help determine the depth and breadth required to answer each question. The ability to distill broad or complex concepts and provide relevant and key points demonstrates a candidate's thorough knowledge of these topics. Answers in point form are acceptable and encouraged and the use of standard medical abbreviations that would be found in medical notes is also acceptable. All questions are scored equally; hence time should be apportioned accordingly, and we encourage you to attempt all questions. Where a breakdown of the question is provided candidates should use this to structure their answer as there is no marks for information provided that does not relate to this breakdown.

Written Results - Overall

Written Exam	MCQ	SAQ
Angoff Pass Mark (%)	69.4	47.95
% of candidates achieving above the pass mark	52	52
Mark required to present for the Oral Exam (%)	61.8	45.96
% of candidates achieving above the invite mark.	74	57
Average Mark (%)	68.2	45.6
Highest Mark	85	62
% of candidates receiving an invitation to the oral component (*successful in both written components*)	52	

Domain Results for Multiple Choice Questions

Subject Domain	Syllabus Components	Syllabus References	Number of Questions	Pass Rate
1	Cellular Physiology, Pharmacology, Antidotes	A, B, C, D, E	9	86%
2	Respiratory System	F	20	67%
3	Cardiovascular System	G	20	62%
4	Renal System, Body Fluid and Electrolytes, Acid- Base	H, I, J	11	73%
5	Nervous System, Musculoskeletal, Autonomic Nervous System.	K, L, M	10	68%
6	Liver, Gastrointestinal System, Nutrition and Metabolism, Thermoregulation, Endocrine System	N, O, P, R, T, U	10	54%
7	Haemotological System, Immunology, Microbiology	Q, S, T	14	69%
8	Obstetric	V	5	84%

Concept Domain	Number of Questions	Pass Rate
Physiology	61	67%
Pharmacology	27	75%
Anatomy and Measurement	11	61%

Domain Results for Short Answer Questions

Subject Domain	Syllabus Components	Syllabus References	Pass Rate
1	Cellular Physiology, General Pharmacology, Antidotes.	A, B, C, D, E	40%
2	Respiratory System	F	52%
3	Cardiovascular System	G	41%
4	Renal System, Body Fluid and Electrolytes, Acid- Base	H, I, J	76%
5	Nervous System, Musculoskeletal, Autonomic Nervous System.	K, L, M	30%
6	Liver, Gastrointestinal System, Nutrition and Metabolism, Thermoregulation, Endocrine System	N, O, P, R, T, U	51%
7	Haemotological System, Immunology, Microbiology	Q, S, T	51%
8	Obstetrics	V	58%

Concept Domain	Pass Rate
Physiology	57%
Pharmacology	52%
Anatomy and Measurement	29%

Individual Results and Examiner Comments for Short Answer Questions

Question 1

a) Explain the mechanisms responsible for the resting membrane potential of a neuronal cell (60% of marks).
b) Describe the Gibbs-Donnan effect (40% of marks).

% of candidates achieving a successful result	54.2
Angoff Cut Mark	10
Average Mark	10.1
Highest Mark	18

(a) Candidates were expected to discuss the 3 main factors that contribute to the neuronal resting membrane potential (RMP). This included:
- Chemical concentration gradients - which are maintained by the active transport of ions primarily via the electrogenic Na^+/K^+ ATPase pump.
- Selective membrane permeability to ions through protein-facilitated channels with detail on the increased membrane permeability to K^+ in the resting state due to open leak channels.
- Electrochemical equilibrium (diffusion potentials) which occur when the chemical driving force generated by the chemical concentration gradient is balanced against the opposing electrical force of the negatively charged intracellular anions.

Importantly, discussion of the above needed to be tailored to the values and mechanisms that underpin the RMP of the neuronal cell, this was overlooked or omitted by many candidates. Better answers discussed the Nernst and Goldman-Hodgkin-Katz predictions governed by the above mechanisms.

(b) For this component of the question a brief description of the Gibbs-Donnan effect was required. Good answers covered the following concepts in their description;
- the unequal distribution of permeable charged ions across a semipermeable membrane that occurs in the presence of impermeable charged ions
- equilibrium is achieved in the presence of electroneutrality or when the product of ions on either side of the membrane is equal.
- resultant effect is an unequal distribution of ions and an osmotic gradient. It also contributes to a small electrical potential difference.

Question 2

Outline the determinants of oxygen delivery to the tissues.

% of candidates achieving a successful result	50.6
Angoff Cut Mark	10.6
Average Mark	10.7
Highest Mark	16

This question primarily relates to the oxygen flux equation

DO_2 (ml/min) = cardiac output (CO) (mL/min) X arterial oxygen content (C_aO_2) (mL/100mL).

Most candidates provided a detailed description of each component, however many candidates included extensive detail on the factors that determine cardiac output without considering that the focus of this question is on oxygen delivery and likely did this at the expense of detail in other areas of the question/equation. A better approach was to provide a brief outline of each component of the oxygen flux equation and then discuss the relative importance of each on tissue oxygen delivery. Excellent answers identified that oxygen delivery to the tissues is importantly determined by local metabolic autoregulation, many candidates omitted this in their answer limiting maximum marks available to them.

Question 3

Compare and contrast the pharmacology of adrenaline and milrinone using the following headings:

a) mechanism of action (30% of marks),
b) pharmacokinetics relevant to the metabolism and elimination of each drug (20% of marks)
c) pharmacodynamics and adverse effects (50% of marks).

% of candidates achieving a successful result	51.8
Angoff Cut Mark	10.1
Average Mark	10.1
Highest Mark	17

The question breakdown and mark allocation provided a guide to the level of detail required for each section. Well scoring answers demonstrated their understanding of the differences and similarities between the drugs rather than a list of pharmacological factors for each drug. When answering a "compare and contrast" question consider, *why would you use one drug over another*. These are decisions we make multiple times a shift in ICU, thus, the important details for metabolism and elimination and pharmacodynamics that may govern why one drug is chosen over the other was expected. For example: *Adrenaline undergoes rapid de-activitation and metabolism via non-organ dependent mechanisms – thus high clearance, making it easy to titrate with a rapid offset, even in organ failure/critical illness. Milrinone requires renal excretion of predominantly unchanged drug – thus has a longer duration of action, slower offset, more difficult to titrate and can accumulate in renal impairment.*

Question 4

a) For both, haemodialysis and haemofiltration, describe the following:
i) the physical principles (40% of marks),
ii) the factors affecting solute clearance (40% of marks).
b) Outline the key components of renal replacement fluids (20% of marks).

% of candidates achieving a successful result	75.9
Angoff Cut Mark	9.9
Average Mark	11.2
Highest Mark	18

Information to answer this question requires assimilation of knowledge across a range of resources.

a) A structured approach divided the answer into haemodialysis and haemofiltration and then described the physical principles and factors that affect solute clearance separately. Expected information included:
   - Haemodialysis; solute movement across a semipermeable membrane by diffusion. Dependent on:
     - solute characteristics (size, charge, protein binding, volume of distribution),
     - dialysis membrane properties (porosity, thickness, surface area)
     - the concentration gradient of substance in dialysate to blood,
     - the rate of solute delivery (blood flow vs dialysate rate).
   - Haemofiltration; a hydrostatic pressure gradient is generated across a semipermeable membrane to drive solute movement. A discussion of the effect of:
     - transmembrane pressure
     - blood flow
     - effluent/ultrafiltration rate
     - plasma oncotic pressure
     - solute concentration in plasma water
     - Sieving coefficient on the clearance

b) For this section a brief outline of typical dialysis fluid was required including the rationale behind the composition and inclusion of each of the following:
   - major electrolytes
   - buffers
   - water
   - special solutions ie. Citrate, Potassium Free

Information on the indications for dialysis, methods of vascular access and anticoagulation regimens was included in many answers however was not required and did not have marks allocated.

Question 5

For each neurotransmitter listed below:

a) acetylcholine (ACh),
b) gamma-aminobutyric acid (GABA),
c) noradrenaline (NorAd),
d) serotonin (5-HT).

Outline the following:

i) target receptors, including type and location (15% of marks per neurotransmitter),
Downstream receptor mechanisms NOT required.
ii) functional role(s) (10% of marks per neurotransmitter).

% of candidates achieving a successful result	38.6
Angoff Cut Mark	10.65
Average Mark	10
Highest Mark	14.5

This question required a brief overview of the major neurotransmitters, their receptors and location. For example:

Acteylcholine
a) Nicotinic receptors (ionotropic – Na, K)
- *N_M (neuromuscular junction) – skeletal muscle end plate*
- *N_N (autonomic ganglia) – all sympathetic and parasympathetic ganglia*
- *in the brain both types are found, are widespread, including basal forebrain and the brainstem cholinergic nuclei*

Muscarinic receptors (metabotropic)
- *M1 – sympathetic system ganglia, CNS*
- *M2 – heart (SA/AV node)*
- *M3 – smooth muscle and glands (GI tract, airways, secretory glands)*
- *M4/M5 – CNS*
- *Muscarinic receptors act indirectly on ion channels or second messengers via G proteins at their effectors organ and can be differentiated by their response to antagonists.*

Candidates had overall good knowledge on ACh and NorAd but struggled to provide correct information on GABA and 5-HT. If these first two were answered in enough detail then a candidate was likely to score close to the pass mark.

Question 6

Outline the potential adverse effects of red blood cell transfusion.
Effects secondary to massive transfusion are NOT required.

% of candidates achieving a successful result	53
Angoff Cut Mark	9.25
Average Mark	8.9
Highest Mark	16.5

This question required a structured approach to cover the breadth of the possible reactions. A common classification and structure used in most of the recommended resources includes:

- Acute immunologic reactions
    - acute haemolytic transfusion reaction;
    - Other acute non hemolytic reactions
        - febrile non haemolytic reactions
        - transfusion related lung injury (TRALI)
- Acute non immunologic reactions
    - metabolic reactions e.g. hyperkalaemia,
    - infection,
    - coagulopathy,
    - fluid overload.
- Delayed immunologic reaction
    - delayed haemolytic transfusion reactions,
    - graft versus host reactions
    - transfusion related immunomodulation.
- Delayed non immunologic reactions
    - iron overload
    - infection.

An 'outline' question requires candidates to provide some but not extensive detail of the adverse effect thus differentiating it from just a list. A lack of a structured approach often resulted in the omission of large sections of the answer scope limiting the marks available.

Question 7

Describe the cardio-respiratory changes that occur throughout pregnancy (excluding parturition).
Include in your answer the factors responsible for these changes.

% of candidates achieving a successful result	57.8
Angoff Cut Mark	9.1
Average Mark	9.5
Highest Mark	17.5

This is a broad question that requires a brief overview of the changes and their causative factors. For example, a primary cardiac change is an increase in cardiac output. A good answer included a description of how the components of cardiac output change, the timing and the mechanisms for these changes. For example:

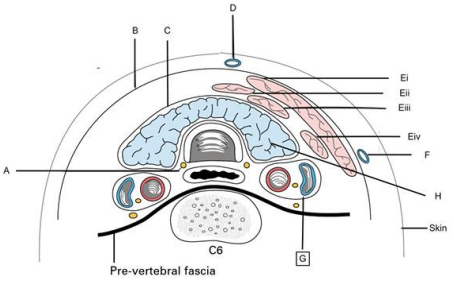
Changes in cardiac output;

- *Increased to maximal 30-40% in second trimester this is secondary to:*
  - *initial decreased SVR - in SBP 15-20mmHg secondary to progesterone mediated vaso and venoD → compensatory increase in HR/SV BRR and + RAAS/ADH/Ald*
  - *increase in blood volume 30% – + by oestrogen, and RAAS/ADH/Ald – Na^+ and H_20 retention → inc. VR.*

Whilst many were able to list the cardiorespiratory changes throughout pregnancy – linking these changes to some of their mechanisms particularly hormonal and accurate descriptions of the timing, elevated a candidate's answer.

Question 8

a) On the diagram below, identify the anatomical structures labelled A-H (40% of marks).
b) Describe the structural anatomy of the trachea, excluding the anatomical relations (45% of marks).
c) Outline the ideal location for the insertion of percutaneous tracheostomy tube (15% of marks).



% of candidates achieving a successful result	38.6
Angoff Cut Mark	10.6
Average Mark	10
Highest Mark	19

This question required candidates to demonstrate their understanding of the anatomical landmarks, necessary knowledge required prior to performing a percutaneous tracheostomy.

a) An at standard answer included the recognition of A as the recurrent laryngeal nerve, B & C as the superficial and pretracheal fascia, and G as the carotid sheath. Candidates who identified the additional structures scored above the expected standard.

b) Inclusion of the trachea's origin in the neck and termination in the mediastinum, a description of the structure of the trachea with mention of C- shaped anterior cartilage rings and trachealis muscle posteriorly was expected for an at standard response. Inclusion of also brief detail on blood supply and innervation was scored at above standard

c) The expected standard required a brief description of a midline anterior approach between the tracheal rings 1-3.

Question 9

Compare and contrast fentanyl and ketamine using the following headings:

a) mechanism of action (20% of marks),

b) pharmacokinetics relevant to the intravenous administration in intensive care (40% of marks),

c) pharmacodynamics and adverse effects (40% of marks).

% of candidates achieving a successful result	51.8
Angoff Cut Mark	10.2
Average Mark	10
Highest Mark	16

The question breakdown provided a guide to the level of detail required for each section. High scoring answers made a direct comparison of the similarities and key differences between the drugs which may influence the use of one over the other and the relevance to critical illness. Both drugs are commonly used in ICU and are level 1 drugs in the syllabus. A detailed knowledge of the pharmacokinetics, pharmacodynamics and adverse effects was expected. Many questions overlooked the reference to "IV administration" and "relevance to ICU" which led to the inclusion of detail not required for this question.

Question 10

Compare and contrast the pharmacodynamics of haloperidol, olanzapine, and quetiapine, relevant to their use in intensive care, using the following headings:

a) primary mechanism of action (25% of marks).

b) extrapyramidal side effects (15% of marks).

c) other receptor mediated effects (30% of marks).

d) cardiac toxicity (15% of marks).

e) idiosyncratic adverse effects (15% of marks).

% of candidates achieving a successful result	21.7
Angoff Cut Mark	7.55
Average Mark	5.6
Highest Mark	14

This is another question where the breakdown and mark allocation provided a guide to the level of detail expected. Whilst these are level 3 drugs in the syllabus, they are commonly used in ICU. It is expected that candidates have a grasp of the key differences in mechanism of action and side effect profiles of first- and second-generation antipsychotics.

a) Candidates were expected to explain the contrasting mechanism of action with haloperidol having the highest affinity for D_2 receptors and less so for the atypical antipsychotics (olanzapine and quetiapine) for which 5-HT_{2a} antagonism is a key mechanism of action.

b) Atypical antipsychotics have lower risks of extrapyramidal side effects related to lower D_2 affinity, and candidates were expected to provide some examples of extrapyramidal side effects.

c) Answers that made mention of alpha and H_1 antagonism with a description of some of the resultant effects (such as sedation with H_1 antagonism) were able to achieve the required standard. Additional marks were awarded for mention of muscarinic antagonism with both quetiapine and olanzapine.

d) It was expected that candidates would identify that all three drugs cause QT prolongation via K^+ channel blockade and that the risk is highest with haloperidol.

e) Well scoring answers listed at least 3 idiosyncratic reactions including neuroleptic malignant syndrome of which the risk is highest with haloperidol.

Question 11

a) Outline the scientific principles that apply to the measurement of end-tidal carbon dioxide using capnography. *Include the techniques of sampling in your answer* ***(30% of marks).***
b) Describe a normal capnograph waveform and its features (20% of marks). A diagram may assist you with your answer.
c) Outline the ventilation and perfusion information that can be derived from the capnograph waveform (50% of marks).

% of candidates achieving a successful result	48.2
Angoff Cut Mark	9.65
Average Mark	9.5
Highest Mark	14

a) This section was generally well answered. Candidates were expected to outline the principles that apply to this method of measurement, describing its relationship to the Beer-Lambert Law and the options of either in-line or side stream sampling of exhaled gases and their implications.
b) This component of the question required candidates to describe the four phases of the capnogram, describe or demonstrate on a diagram where the end tidal CO2 value is derived and indicate the alpha and beta angles and what they represent. This part of the question could have been achieved by providing a rough but accurate drawing of the carbon dioxide vs time graph with axes, key features labelled and a few explanatory points or providing a more detailed description of the shape and phases of the graph including the features outlined above. Many drawings did not help the candidates due to their inaccuracies in labelling or incorrect shape/axis, many went on to also describe what they had already drawn not taking advantage of the time saved in providing an accurate drawing encompassing all relevant points.
c) This section examined the translation of measurement methods into clinical application. Many candidates provided a good structure dividing the derived information into perfusion and ventilation. The information provided under these headings tended to lack depth and explanation to score well. For example; a candidate may list – cardiac output – however not link it to the reason it can be inferred from the capnograph. Expected information for a good answer included the following key points with an example of each:

- Perfusion: PETCO2 approximates PaCO2 and changes in PETCO2 reflect changes in pulmonary perfusion and thus cardiac output.
- Ventilation: PETCO2 is an indicator of endotracheal tube placement, respiratory rate, and adequacy of alveolar ventilation. The slope of phase three provides an indication of the heterogeneity of alveolar time constants throughout the lung.

Question 12

a) Describe the physiological factors that contribute to pulmonary vasoconstricton. *Include the mechanisms involved in your answer* ***(60% of marks).***

b) For each of the inhaled pulmonary vasodilators, nitric oxide and prostacyclin:

i) describe the mechanism(s) of action (25% of marks)

ii) outline the adverse effects (15% of marks).

% of candidates achieving a successful result	44.6
Angoff Cut Mark	9
Average Mark	8.3
Highest Mark	15.75

a) Many answers discussed factors that contribute to pulmonary vascular resistance. Whilst pulmonary vasocontriction is a component of this, discussing PVR would lead to including other details on a broader range of concepts detracting from the level of detail needed when just focusing on pulmonary vascular tone. This question required a discussion of the effect of O_2, CO_2, pH, and neurohormonal mediators on pulmonary vascular tone. O_2 is the major determinant of the pulmonary vascular tone, and a more detailed discussion of the mechanism of hypoxic pulmonary vasoconstriction was expected. CO_2 and pH have a lesser effect. A description of a range of neurohormonal mediators such as catecholamines and their contribution to pulmonary vasoconstriction also attracted marks.

b) This section sought knowledge of these commonly used pulmonary vasodilators and was generally well answered. Given the verb "describe" for mechanism of action, the cellular mechanisms by which these drugs cause pulmonary vascular dilation was expected. Adverse effects required a list of common or serious adverse effects AND a brief outline of the mechanism by which they occur. Commonly candidates provided a list of adverse effects however many answers didn't link the mechanism to the side effect or omitted common OR serious adverse effects.

Question 13

Outline the determinants of venous return to the right heart.

% of candidates achieving a successful result	34.9
Angoff Cut Mark	9.45
Average Mark	8.3
Highest Mark	15.5

Venous return is the volume of blood returning to the heart per unit time and is determined by the pressure gradient [mean systemic filling pressure (MSFP]) – right atrial pressure (RAP)] divided by the resistance to venous return. High scoring answers structured their discussion around this definition and were able to link other physiological factors like intrathoracic pressure, skeletal muscle pump activity, venous valves, and posture to changes in venous return. Pressure gradient is the major determinant of venous return and therefore a more detailed discussion of the effect of blood volume and venous tone on MSFP as well as the determinants of RAP was expected and was more heavily weighted in its scoring. Normal values when provided also attracted marks.

A common pitfall was to provide a detailed discussion of the determinants of cardiac output at the expense of other important factors mentioned above – thus limiting the available marks that could be awarded.

Question 14

a) Outline the distribution of calcium in the body and provide the normal range of plasma calcium concentration (20% of marks).
b) Outline the regulation of plasma calcium (50% of marks).
c) Outline other physiological factors that may influence plasma calcium concentration (30% of marks).

% of candidates achieving a successful result	74.7
Angoff Cut Mark	9.2
Average Mark	10.5
Highest Mark	15

The question breakdown provided a clear structure to approach this question.
a) This section required a factual recall of information and was generally well answered.
b) Good answers included a comprehensive overview of parathyroid hormone (PTH), Vitamin D and calcitonin, (the three hormones involved in calcium regulation). A good structure included sensor and effector mechanisms.
c) This section explored the understanding of factors that affect plasma calcium levels such as protein binding; acid-base status and its effect of ionisation of calcium; and other hormones e.g. glucocorticoids which lower plasma calcium levels. A simple list of some of these factors particularly albumin and plasma proteins, with a brief explanation as to their effect on plasma calcium and why, was enough to score well.

Question 15

Compare and contrast neostigmine and sugammadex using the following headings:
a) drug class and mechanism of action (30% of marks),
b) indications for use (15% of marks),
c) dose and dosing considerations (15% of marks),
d) pharmacodynamics and adverse effects (40% of marks).

% of candidates achieving a successful result	45.8
Angoff Cut Mark	8.85
Average Mark	8.6
Highest Mark	14.5

Answers were generally well structured by following the subheadings provided. Common errors and omissions related to either limited knowledge about both drugs with some inaccurate information or whole sections not answered. Neostigmine and sugammadex are used frequently in clinical practice and the information required by this question directly relates to the knowledge required to safely administer these drugs.

Question 16

With respect to bile, outline the following:

a) composition (20% of marks),
b) functions (20% of marks),
c) storage (10% of marks),
d) factors regulating delivery into the duodenum (50% of marks).

% of candidates achieving a successful result	63
Angoff Cut Mark	9.5
Average Mark	10
Highest Mark	14.75

This question tests factual recall of knowledge and was generally well answered. Candidates used the provided headings and mark allocation to structure their answers. The areas with the most common omissions related to the composition and storage of bile. Candidates are encouraged to not overthink questions that appear surprisingly simple – for part c) mentioning that bile is stored in the gall bladder where is undergoes concentration was enough to meet the standard required.

Question 17

a) Compare and contrast fever and hyperthermia using the following headings:

i) physiological mechanisms (30% of marks),
ii) causes (30% of marks).

With respect to paracetamol:

i) outline the mechanism of action (15% of marks),
ii) list the adverse effects (10% marks),
iii) outline mechanism of toxicity. (15% of marks). Management of toxicity is NOT required.

% of candidates achieving a successful result	16
Angoff Cut Mark	10.05
Average Mark	7.1
Highest Mark	12

a) Answers that scored well in this section were able to provide a description of fever and hyperthermia including the physiological mechanisms of each, their triggers and regulation. Then providing some explanation of the differences. Hyperthermia is due to a failure of thermoregulatory responses to deal with heat gain (from either the internal or external environment). The hypothalamic set point in hyperthermia is unaltered. Whereas fever is part of the innate immune response and involves an increase in the set-point and inappropriately triggering of the body's heat conservation mechanisms. Candidates were largely able to list some causes of fever and hyperthermia; however, the role of pyrogens in fever was commonly omitted.

b) The pharmacology of paracetamol required an overview of the mechanism of action – with focus on its anti-COX activity and a brief statement regarding its other non-COX mediated effects. Adverse effects were generally well covered, again a brief demonstration of the relative commonality of the effects or the seriousness elevated good answers. The toxicity section required a brief outline of the mechanism including depletion of glutathione leading to NAPQI accumulation, and subsequent oxidative stress injury to hepatocytes.

Question 18

With respect to viscoelastic assays, describe the expected alterations and the underlying mechanisms resulting from the following:

a) platelet dysfunction (40% of marks),

b) therapeutic heparin use (40% of marks),

c) hyperfibrinolysis (20% of marks).

Either TEG or ROTEM is acceptable for your answer.

% of candidates achieving a successful result	29
Angoff Cut Mark	8.5
Average Mark	6.2
Highest Mark	13.5

This question required candidates to apply their knowledge of viscoelastic assays to describe changes in different haematological states. The key viscoelastic changes to mention under each state include:

- clot firmness
- rate of clot initiation
- rate of clot formation to maximum thickness
- rate of clot lysis

a) Platelet dysfunction is associated with decreased clot firmness, and prolonged time to maximum thickness due to impaired platelet-fibrin interaction. Clot initiation is unchanged.

b) Therapeutic heparin binds to antithrombin III and inactivates several serine proteases in the coagulation pathway and slows conversion of fibrinogen to fibrin. The typical changes seen on a viscoelastic assay include delayed clot initiation, decreased firmness, and reduced maximal thickness.

c) Hyperfibrinolysis increases the rate of clot lysis by increasing the activity of the fibrinolytic system. Using this to describe the resultant TEG/Rotem parameters was required.

Commonly candidates were able to list some of the alterations seen with each state however omitted the reasons why these changes came about. Candidates who provided a thorough overview of the changes seen and the areas of the TEG/Rotem measurements that were preserved scored highly. Details of the normal coagulation pathways and the mechanisms of TEG/Rotem including how the assays are performed were not required, though many candidates provided detailed descriptions of these at the expense of considering the above changes.

Question 19

a) Explain the multi-compartment pharmacokinetic model (80% of marks).
b) Outline with examples, the characteristics of drugs that adhere to this model (20% of marks).

% of candidates achieving a successful result	23
Angoff Cut Mark	8.8
Average Mark	7.4
Highest Mark	13.5

Well scoring answers explained the concept of compartment models including the central and peripheral compartments and the observation of drug concentration over time as it distributes between compartments. Candidates were expected to discuss the different phases involved (distribution phase from central to peripheral compartments and terminal phase from peripheral to central compartment prior to elimination). The clinical relevance of these models is in predicting drug offset following single dose vs infusions depending on extent of distribution to other compartments; understanding the link between plasma concentration and clinical effect at non-plasma effect site; and guiding dosing decisions. A diagram was not required but was well utilised to explain these concepts by candidates.
Good answers considered, with examples, physicochemical, pharmacokinetic and pharmacodynamic factors that apply to drugs that follow a multicompartment model.

Question 20

a) Classify hypersensitivity reactions and provide a brief outline of the immunological mechanisms underlying each type (20% of marks).
b) Explain the immunological basis of anaphylaxis (50% of marks).
c) Outline the pharmacology of adrenaline relevant to its use in the management of anaphylaxis (30% of marks).

% of candidates achieving a successful result	51
Angoff Cut Mark	10.8
Average Mark	10.3
Highest Mark	17

a) Most candidates were able to classify hypersensitivity reactions correctly. Candidates are reminded to use the mark allocation as a guide to the level of detail with many providing extensive detail on each category when only a brief description was required.
b) This section carried the most marks and therefore a more detailed discussion was expected. This included the 3 essential phases of the anaphylaxis response: sensitisation, activation and mediator release. High scoring answers also discussed amplification and the biphasic response. A mention of relevant mediators was expected. Candidates were familiar with histamine but omitted other mediators such serotonin and prostaglandins.
c) Adrenaline is a level 1 drug in the syllabus and was generally well answered, better answers tailored their pharmacology description to information that was relevant to the management of anaphylaxis ie. Including the role in mast cell stabilisation and the mechanism of this. Pharmacokinetic information expected included IM delivery, fast onset, fast offset due to metabolism thus may need repeated doses and can be given by infusion for severe anaphylactic shock and titrated to haemodynamic parameters.

ORAL SECTION

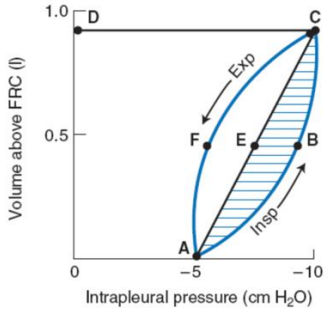
Overall VIVA Results

% of candidates achieving a successful result	81
Borderline Regression Pass Mark	56.96 %
Borderline Regression Cut Mark	52.90 %
Average Mark	59.65 %
Highest Mark Achieved	76.88 %

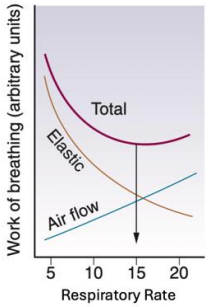
VIVA 1 – Domain 2 – Respiratory Physiology and Pharmacology

% of candidates achieving a successful result	57.69
Borderline Regression Pass Mark	11.77
Average Mark	12.49
Highest Mark	17

1.Explain how the prone position may affect gas exchange in a healthy adult?
2. How might the prone position affect pulmonary vascular resistance?
3. How might the prone position affect respiratory system compliance?
4. How does dynamic compliance compare with static compliance?
5. This is a curve for a normal lung depicting work of breathing.



How might this curve change with reduced compliance?
6. How might this curve change with increased airway resistance?
7. This is a normal graph of respiratory rate vs work of breathing.



What changes would you expect to see for a patient with reduced compliance?
8. What about with asthma?
9. What factors determine how much of an inhaled bronchodilator reaches the target site?
10. What is one major advantage and disadvantage of intravenous, rather than inhaled bronchodilator administration?

VIVA 2 – Domain 4 - Acid Base, Renal Physiology and Pharmacology

% of candidates achieving a successful result	38.46
Borderline Regression Pass Mark	11.13
Average Mark	10.88
Highest Mark	18

1.Describe the abnormalities in the following arterial blood gas.

Parameter	Measured Value	Units	Normal Range(s)
FiO_2	0.5		
pH	7.40	-	7.35 - 7.45
$PaCO_2$	29 (3.9)	mmHg(kPa)	35 - 45 (4.7 - 6)
PaO_2	76 (10.1)	mmHg(kPa)	75 - 100 (10 - 13)
HCO_3	18	mmol/L	22 - 26
BE	-6	-	-2 - 2
Na^+	141	mmol/L	135 - 145
K^+	3.3	mmol/L	3.5 - 5.5
Cl^-	115	mmol/L	99 - 105
iCa	1.21	mmol/L	1.1 - 1.3
Alb	37	g/L	40 - 42
BSL	7.0	mmol/L	3.5 - 7.8
Lactate	2	mmol/L	< 1

*** assume normal temperature and pressure*

2. What is the clinical significance of measuring Base excess versus bicarbonate?
3. Why is the bicarbonate buffer considered the most important extracellular buffer?
4. If you were to give a carbonic anhydrase inhibitor, what effect will this have on the body's acid base balance?
5. How is bicarbonate handled in the distal tubule?
6. How does spironolactone act on the kidney?
7. If there was no urinary buffer, what would happen to the body's acid base balance?
8. What is the role of ammonia production in chronic metabolic acidosis?

VIVA 3 – Domain 6 - Gastrointestinal Physiology and Pharmacology

% of candidates achieving a successful result	50.00
Borderline Regression Pass Mark	11.59
Average Mark	11.85
Highest Mark	17

1. How does critical illness predispose to stress ulcer formation?
2. Why are Proton Pump Inhibitors used for prevention (of stress ulcer formation)?
3. What are the adverse consequences of PPI administration?
4. What are the mechanisms responsible for a rising urea after an upper GI bleed?
5. Why may we use terlipressin to assist in the management of variceal bleeding?
6. What's the mechanism of nausea due to a large volume UGI bleed
7. Why would you use metoclopramide for this patient?
8. How does erythromycin differ as a prokinetic to metoclopramide?
9. How does lactulose assist in liver disease?

VIVA 4 – Domain 6 - Nutrition, Metabolism and Endocrine Physiology and Pharmacology

% of candidates achieving a successful result	61.54
Borderline Regression Pass Mark	10.23
Average Mark	11.11
Highest Mark	16.5

1. Explain the metabolic response to prolonged fasting (>16 hours).
2. How might the response to fasting differ in a neonate?
3. By what mechanism might a non-selective beta-blocker cause hypoglyaemia in a neonate?
4. How will the administration of IV adrenaline alter glucose homeostasis?
5. Following a period of starvation, why do electrolytes become deranged with reintroduction of calories?
6. Explain the physiological consequences of an absence of insulin?
7. How is insulin modified so as to alter its duration of action?
8. Describe the pharmacodynamic effects of exogenous glucagon.

VIVA 5 – Domain 3 - Cardiovascular Physiology and Pharmacology

% of candidates achieving a successful result	42.31
Borderline Regression Pass Mark	10.56
Average Mark	10.05
Highest Mark	15.5

1. Explain the effect of high serum potassium on the ventricular action potential?
2. How is the SA node action potential changed by high serum potassium?
3. Relate those changes in the action potential to the changes on the ECG (in hyperK)?
4. How does iv calcium help in this situation?
5. How does vagal stimulation affect the action potential?
6. How is digoxin toxicity affected by serum potassium level?

VIVA 6 – Domain 5 - Pain Physiology and Pharmacology of Local Anaesthetics

% of candidates achieving a successful result	63.46
Borderline Regression Pass Mark	11.74
Average Mark	13.05
Highest Mark	17.5

1. Describe how a peripheral noxious stimulus is detected and transmitted to the level of the spinal cord.
2. How is this signal transmitted in the spinal cord?
3. How can descending pathways from the brain modulate this signal?
4. The skin around a wound can become abnormally painful. Explain this hyperalgesia and allodynia?
5. What is the mechanism of action of lignocaine?
6. Why are some nerve fibres more susceptible to local anaesthetics?
7. Describe properties of local anaesthetics that determine their onset and duration of action? Can you give some examples?
8. IV Lignocaine can be used to treat arrhythmias. Why do we use lignocaine and not bupivacaine?
9. What are the cardiovascular features of local anaesthetic systemic toxicity (LAST)?
10. What is the antidote for LAST and how does it work?

VIVA 7 – Domain 1 (5) - Pharmacokinetics Relevant to ICU

% of candidates achieving a successful result	61.54
Borderline Regression Pass Mark	11.89
Average Mark	12.66
Highest Mark	18

1. The ICU pharmacist tells you that your patient's phenytoin level is low. Explain why this might happen?
2. You provide a small dose increase, and the patent demonstrates phenytoin toxicity. Why might this have occurred?
3. Why is a loading dose used for phenytoin to treat seizures?
4. Explain the toxic effects of phenytoin relevant to use in the ICU?
5. A patient has been on a 3-day infusion of propofol and fentanyl. Explain what happens to the plasma concentrations after the infusions are ceased?
6. What is CSHT and what factors influence fentanyl's?
7. How does context-sensitive half time differ from elimination half-life, and which is more clinically useful in ICU?
8. Explain strategies to mitigate fentanyl's long CSHT in ICU.

VIVA 8 – Domain Microbial Physiology and Anti-microbial Pharmacology

% of candidates achieving a successful result	71.15
Borderline Regression Pass Mark	12.20
Average Mark	13.37
Highest Mark	17.5

1. Explain why a continuous infusion of meropenem may be more effective than regular intermittent dosing?
2. In critical illness we risk underdosing meropenem. Explain what patient and drug factors lead to this.
3. Why don't we give gentamicin as a continuous infusion?
4. How are the spectrums of activity different between gentamicin and meropenem?
5. This is a gram stain (Gram -ve Bacilli image provided). What class of bacteria is demonstrated and why is it that colour?
6. This organism was cultured from a patient's urine. Name 4 likely organisms?
7. This organism is resistant to amoxicillin but is sensitive to meropenem. How is meropenem active over a broader range of bacteria in comparison to amoxicillin?
8. Describe other mechanisms that bacteria may use to evade antibiotics with common examples?
9. How can you make an antibiotic more effective if resistance is starting to develop?
10. How does the addition of clavulanic acid change the spectrum of amoxicillin?

COMMENTS FROM THE CHAIR

The CICM First Part Examination ensures candidates possess a thorough understanding of the fundamental medical sciences that underpin intensive care practice. In doing so it encourages Intensive Care trainees to develop this knowledge and understanding, an important part of the ICU curriculum. Substantial work and investment from the Part 1 Examiner Court and the College of Intensive Care Medicine have been dedicated to standardising the Part 1 Exam in accordance with the Australian Medical Council's recommendations. These changes to the exam have been made in consultation and under the supervision and guidance of ACER (Australian Council for Education Research), an independent, not for profit, education and assessment expert organisation. A significant focus of the Chair, the First Part exam committee and examiner court is ensuring that the exam drives learning that is relevant to Intensive Care Medicine by realigning the exam with this purpose. Candidates may have noticed a shift in the knowledge required, driven by a shift in the questions and how they are asked. In the written exam candidates are required to demonstrate their knowledge and understanding of concepts with some application, that application is in the context of critical care and ICU. In the VIVAs, Candidates are asked to apply this understanding to different physiological circumstances, explaining and describing the processes that underpin ICU practice and how different populations behave in response to disease and therapies. This is still within the remit of the First Part Exam, using fundamental physiology and pharmacology principles to explain why we do what we do and when we do it. This push to improve the external validity has occurred alongside many initiatives to improve the overall reliability and feasibility of the exam. An increasing focus is encouraging candidates to learn with the purpose of the acquisition of this fundamental knowledge to improve their ICU practice, not just to “pass the exam”. We thank the College and the fellowship community for their support and endeavors in training the future intensivist to the high standard our program is renowned for and their continued support of this important part of a highly reputable training program.

On behalf of the College of Intensive Care Medicine and the First Part Examiners, we wish you all the best as you prepare for and undertake this important step in your intensive care career.

Dr Naomi Pallas
Chair of the First Part Committee

Dr Samuel Marment and Dr Patricia Hurune
Deputy Chairs of the First Part Committee

A sincere thank you and acknowledgement of the following examiners involved in this sitting of the First Part Exam.

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