COLLEGE OF INTENSIVE CARE MEDICINE
OF AUSTRALIA AND NEW ZEALAND

SECOND PART EXAMINATION

EXAM REPORT

AUGUST / OCTOBER 2018

This report is prepared to provide candidates, tutors and Supervisors of Training with information regarding the assessment of candidates' performance in the CICM Second Part Examination. Answers provided are not necessarily model answers but a guide as to what was expected and for use as an educational resource. Trainees should discuss the report with their tutors so that they may prepare appropriately for future examinations. Trainees should not rely solely on writing practice answers to previous exam questions for exam preparation, and first establish a strong knowledge base from learning at the bedside and studying relevant texts, journals and on-line sources.

The exam comprises a written section and an oral section. The written exam consists of two 2.5hr papers of 15 short answer questions each. Candidates are required to score at least 50% in the written section to be eligible to sit the oral section. The oral exam consists of eight interactive vivas and two separate clinical "hot cases".

The tables below provide an overall statistical analysis as well as information regarding performance in the individual sections. A comparison with data from the five previous exams is provided.

In all sections of the exam the candidate has to demonstrate performance consistent with that of a junior consultant, i.e. demonstrate he/she has the ability for safe, effective, independent practice as an Intensivist. Candidates who are not at this level are encouraged to defer their attempt at the exam.

Overall Performance	October 2018	May 2018	October 2017	May 2017	October 2016	May 2016
Presenting for written (Including OTS)	67	49	49	40	49	41
Carrying a pass from a previous attempt	7	11	8	9	14	14
OTS Exempt	0	0	0	0	0	0
Total number presenting (written + carry + OTS)	74	60	57	49	63	55
Invited to orals (>50% in written section)	47	28	39	24	34	27
Total number invited to oral section	54	38	47	33	48	41

Analysis of Performance in Individual Sections	October 2018	May 2018	October 2017	May 2017	October 2016	May 2016
Successful in the written section	47/67 70%	28/49 57%	39/49 80%	24/40 60%	34/49 69%	27/41 66%
Successful in the Hot Case section	33/54 61%	23/38 61%	33/47 70%	15/33 45%	33/48 69%	18/41 44%
Successful in both Hot Cases	19/54 35%	11/38 29%	18/47 38%	11/33 33%	24/48 50%	7/41 17%
Successful in the Viva section	36/54 67%	31/38 82%	36/47 77%	24/33 73%	38/48 79%	18/41 44%

Sectional Pass Rates	October 2018		May 2018		October 2017		May 2017		October 2016		May 2016	
	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark	Pass rate	Highest individual mark
Hot Case 1	57%	85%	58%	85%	60%	100%	42%	90%	65%	93%	37%	80%
Hot Case 2	65%	90%	58%	90%	62%	98%	55%	95%	65%	90%	46%	90%
Viva 1	56%	75%	76%	95%	64%	90%	73%	85%	65%	88%	71%	92%
Viva 2	46%	95%	87%	100%	30%	68%	73%	90%	67%	85%	32%	70%
Viva 3	74%	85%	87%	100%	51%	83%	55%	71%	77%	95%	66%	90%
Viva 4	63%	95%	71%	98%	62%	83%	73%	93%	46%	90%	51%	80%
Viva 5	70%	83%	50%	80%	79%	100%	70%	77%	44%	95%	76%	85%
Procedure Viva	81%	95%	53%	90%	45%	78%	73%	90%	79%	100%	66%	85%
Radiology Viva	30%	77%	76%	97%	66%	95%	73%	94%	100%	92%	41%	89%
Communication Viva	50%	90%	53%	84%	91%	100%	52%	95%	60%	95%	10%	85%

Oral Section Pass Rates	October 2018	May 2018	October 2017	May 2017	October 2016	May 2016
Candidates who scored >50% in written section and passed the overall exam	35/47 **75%**	22/28 **79%**	30/39 **77%**	17/24 **71%**	25/34 **74%**	15/27 **56%**
All candidates invited to oral section and passed the overall exam (written + carry + OTS)	39/54 **72%**	30/38 **79%**	37/47 **79%**	21/33 **64%**	39/48 **81%**	18/41 **44%**
Overall Pass Rate	39/74 **53%**	30/60 **50%**	37/57 **65%**	21/49 **43%**	39/63 **62%**	18/55 **33%**

EXAMINERS' COMMENTS

Written Paper

The pass rate for the written section was higher than in previous years. Nine of the thirty questions had pass rates below 50%. Questions dealing with antimicrobial prescription in renal replacement therapy, immune reconstitution syndrome, and systems for pleural drainage were poorly answered.

As in previous exams, candidates who failed questions did so for one or more of the following reasons:

- Insufficient knowledge of the topic in question
- Insufficient detail and/or depth of the answer
- Poorly structured answer
- Inadequate reference to supportive evidence where relevant
- Failure to answer the question as asked
- Omission of all or part of the question

Candidates that failed questions most often gave insufficiently detailed answers that were not at the level expected of a junior consultant. Candidates often gave generic "proforma" answers that did not deal with the specific issues in the question.

Candidates are advised to read the questions carefully and thoroughly and ensure they answer the question as asked and address all parts of each question. **Candidates are reminded to make sure their writing is legible and to avoid using non-standard abbreviations**. Candidates are also reminded that professional conduct is assessed throughout the exam process and that inappropriate comments written on the answer paper are not acceptable.

Candidates who failed the written section passed an average of 12/30 questions compared with candidates scoring >50% and gaining an invitation to the oral section, passing an average of 20/30 questions.

SECOND PART WRITTEN EXAMINATION

(A) Write your answers in the blue book provided

(B) Start each answer on a **new page** and indicate the **question number**. It is not necessary to rewrite the question in your answer book

(C) You should aim to answer each question in **ten** minutes

(D) The questions are worth **equal** marks

(E) Record your **candidate number** and each **question number** on the cover of each book and hand in all books

GLOSSARY OF TERMS

Critically evaluate:	Evaluate the evidence available to support the hypothesis
Outline:	Provide a summary of the important points
List:	Provide a list
Compare and contrast:	Provide a description of similarities and differences (E.g. Table form)
Management:	Generic term that implies overall plan. Where appropriate, may include diagnosis as well as treatment
Discuss:	Explain the underlying key principles. Where appropriate, this may include controversies and/or pros and cons

NOTE

Where laboratory values are provided, abnormal values are marked with an asterisk (*****).

Please note that in this report all images from the SAQs have been removed.

Question 1

With respect to Clostridium Difficile (CD) colitis:

a) List five risk factors for infection. (10% marks)

b) What infection control measures would you take in a patient diagnosed with CD? (30% marks)

c) Outline the approach to diagnosis and pharmacological management of severe CD colitis. Include the rationale for Faecal Microbial Transplantation and under what circumstances you would consider its use. (60% marks)

ANSWER TEMPLATE

a) List 5 risk factors for infection.
Antimicrobial use, especially fluoroquinolones, clindamycin, broad spectrum penicillins and cephalosporins. *(Specific antibiotics expected)*
Increasing age
use of PPI,
inflammatory bowel disease,
organ transplants, chemotherapy, chronic kidney disease, immune deficiency
exposure to an infected individual,
Nursing home/health care facility resident

b) **What infection control measures would you take in a patient diagnosed with CD?**
Strict contact precautions
Isolation in single room
PPE: healthcare workers should wear gloves, gowns, 5 moments of hand hygiene should be observed
Use of soap and water more effective than alcohol based had wash (spores are resistant to killing by alcohol) in outbreak situations.
Use of disposable equipment when possible
Post discharge disinfection of the room

c) Outline the approach to diagnosis and pharmacological management for severe CD colitis. Include the rationale for Faecal Microbial Transplantation and under what circumstances you would consider its use.
Diagnosis:
Diarrhoea
Radiographic evidence of ileus or megacolon
Positive stool testing - either ELISA or PCR
Presence of pseudomembranes on sigmoidoscopy

Pharmacological Management

Severe CD colitis – oral vancomycin (or fidaxamicin) and iv metronidazole.
Fidaxamicin may be an alternative if vancomycin is not available or not tolerated.
Vancomycin can be given rectally if there is severe ileus

Faecal Microbial Transplantation (FMT)
The human colonic microbiota, which provides colonization resistance against bacterial pathogens, is a key determinant in the pathogenesis of C. difficile. After exposure to oral antibiotics, a decline in faecal microbial diversity is common and may last many months. FMT reconstitutes healthy microbiota.
Primarily indicated for recurrent disease that has not responded to antibiotic treatment

Examiners Comments:

Candidates need to read the question carefully; part c) specified severe infection which was not addressed in some answers.

Maximum Score	8.7
Percentage Passed	97.1%

Question 2

A 75-year-old male is admitted to your ICU for management of severe chest pain from unilateral rib fractures with a flail segment following major blunt chest trauma. He has no other injuries. He is haemodynamically stable with a respiratory rate of 30 breaths/min and oxygen saturation of 99% on room air.

Discuss the available options for analgesia, including their advantages and disadvantages.

ANSWER TEMPLATE

First-line measures
Paracetamol
Intravenous opioid PCA
Second-line measures
IV ketamine infusion 4-16 mg/h
Tramadol

These have the advantages of simplicity and familiarity.
Disadvantages include lack of efficacy, and side effects of sedation, impaired cough, respiratory depression, and agitation or delirium.

Regional anaesthetic techniques

Thoracic Epidural
Benefits
Analgesia is better than with PCA
Better MIP (maximum inspiratory pressure) than with PCA
Avoidance of sedation
Less delirium
Less risk of respiratory depression

Disadvantages
Insertion requires expertise
Risk of failure
Risk of infection
Risk of epidural haematoma
Hypotension
Bradycardia in case of a high block

Intercostal nerve block
Advantages
Simpler than epidural
May require multiple intercostal levels (risk of local anaesthetic toxicity)

Paravertebral catheter infusion
Less effective than epidural, but lower rate of systemic hypotension.
Patients can be discharged to home with a paravertebral catheter in place.

Intrapleural infusion
Relatively contraindicated – NSAIDs, COX-2 inhibitors (risk of renal failure and/or GI bleed)

Although there are no randomized trials comparing the efficacy of these modalities, trauma guidelines recommend epidural analgesia for patients with four or more rib fractures and suggest its use in those

with fewer fractures who are older than 65 years or who have significant cardiopulmonary disease or diabetes mellitus.

Other options
Although not a primary analgesic option, invasive or non-invasive mechanical ventilation may reduce analgesic requirements by splinting a large flail segment. Disadvantages of complexity, risks associated with intubation, and IMV, as well as patient discomfort and aspiration risk in NIV

Surgical fixation of the fractures
This has been shown to reduce the chronic pain with non-union and help with the weaning of patients with rib fractures causing flail chest, prevents traumatic thoracoplasty
Disadvantages of invasive procedure with associated risks, may require post-operative ventilation.

Maximum Score	8.5
Percentage Passed	94.1%

Question 3

Compare and contrast Guillian-Barré syndrome (GBS), and acute transverse myelitis (ATM) in terms of the relevant history, the clinical features, and the relevant investigation findings.

ANSWER TEMPLATE

	Guillian-Barré	**Acute Transverse Myelitis**
Relevant History	Antecedent respiratory or diarrhoeal illness Campylobacter Jejuni Viral – EBV, HSV Mycoplasma Vaccination	Antecedent respiratory, gastrointestinal, or systemic illness in 30-60%, can occur as part of the spectrum of multiple sclerosis, may be seen in patients with acute disseminated encephalomyelitis, other CNS infections or associated with a systemic autoimmune disease
Motor Weakness	Ascending, symmetrical motor weakness Parasthesia/pain Hypo/areflexia	Pyramidal weakness below level of spinal cord lesion, bilateral signs
Cranial Nerve Palsy	Common Uni-/bilateral facial Bulbar	Rare, may be associated with optic neuritis if part of MS spectrum
Dysautonomia	Yes	May be present
Sensory Deficit	Absent or Mild, distal	Clearly defined sensory level all modalities (spinothalamic and posterior columns) on the trunk at level of involvement
CSF	Elevated protein. No pleocytosis.	Abnormal in 50%, moderate lymphocytosis (typically <100/mm3) and an elevated protein. Glucose levels are normal. Oligoclonal bands are usually not present in isolated TM, and when present suggest a higher risk of subsequent MS
Neurophysiology	Abnormal spontaneous activity	Decreased/ unrecordable motor evoke potentials to lower limbs especially on

	Normal MUPs initially. Reduced recruitment.	lumbar stimulation and evidence of denervation in leg muscles
MRI	Not diagnostic	Gadolinium-enhancing signal abnormality (extending over one or more cord segments. Cord oedema at the level.

Maximum Score	7.5
Percentage Passed	60.3%

Question 4

What are the principles involved in determining the loading dose and dosing frequency of antimicrobials in patients undergoing continuous veno-venous haemodiafiltration (CVVHDF)?

ANSWER TEMPLATE

Initial doses of drugs depend on the volume of distribution of the drug. For most antibiotics this is either unchanged or increased in critically ill patients with renal failure, so the initial dose should be a standard dose or higher.

Subsequent dosing depends on clearance and PK-PD relationships.

Clearance will depend on hepatic function (for those drugs that are hepatically metabolized) and residual renal function and clearance by CVVHDF (renally excreted drugs).

Clearance by CVVHDF depends on ultrafiltration rate + dialysis flow rate (=effluent rate) and saturation coefficient.

Saturation coefficient/sieving is predominantly dependent on protein binding and to a lesser extent on membrane material.

Residual renal function can be estimated from *measured* creatinine clearance, but this will overestimate the clearance of drugs that undergo significant tubular reabsorption (e.g. fluconazole, colistin).

The clearance determines the appropriate infusion rate (or dose and frequency) for time dependent antibiotics, dosing interval for concentration dependent antibiotics.

Information on dosing frequency can be obtained from therapeutic drug monitoring during therapy
Give no marks for molecular size (antibiotics are relatively small molecules) or discussions related to choosing antibiotics.

Maximum Score	6.5
Percentage Passed	22.4%

Question 5

List the findings, advantages and disadvantages of the following methods of assessment in a patient with right ventricular failure secondary to pulmonary hypertension:

a) Clinical bedside Assessment. (30% marks)

b) Transthoracic Echo. (40% marks)

c) Pulmonary Artery Catheter. (30% marks)

ANSWER TEMPLATE

Findings:
- Raised JVP with prominent A wave, pulsatile liver.
- Loud P2, RV/parasternal heave
- TR murmur
- Bilateral Peripheral edema
- Hypotension if severe

Advantages
- Quick
- Simple
- Cheap
- Non-invasive

Disadvantages
- Poor reproducibility
- Often difficult in ICU – immobility of patient, equipment, dressings etc
- May be impaired by patient habitus
- Non-quantitative
- Continuous monitoring impractical

Transthoracic Echo

Clinical Assessment

Findings
- ECHO: TR, long axis cavity size, short axis septal kinetics, apex loses triangular shape,
- RV size compared to LV size,
- loss of inspiratory collapse of IVC, dilation of PA
- RVSP > 25 for acute
- TAPSE <16mm

Advantages
- Non -invasive
- Qualitative and quantitative
- Can give other information relevant to clinical state
- Record and retrieve results

Disadvantages
- Expertise required
- Expensive equipment
- Inter operator variability
- Unable to perform continuous monitoring
- Often difficult in ICU – immobility of patient, equipment, dressings etc
- May be impaired by patient habitus

Pulmonary Artery Catheter

Findings
- Right heart failure: high CVP, low CI, high PVR
- Elevated pulmonary artery pressures (PAPm >25mmHg)

Advantages

- Continuous monitoring
- Gold standard for pulmonary hypertension measurement
- Quantitative measurement
- No inter operator variability
- Can give other information relevant to clinical state
- Therapeutic uses – iv access, pacing
- Record and retrieve results

Disadvantages

- Invasive
- Risk of serious complications – infection, bleeding, pneumothorax, vessel rupture
- Drift of measurements
- Complex, now unfamiliar in many units
- Time limited – should not be left in for > 72 hours

Maximum Score	6.6
Percentage Passed	40.3%

Question 6

Give the rationale for using the following techniques in a randomised controlled clinical trial:

a) Allocation concealment. (30% marks)

b) Block randomization. (30% marks)

c) Stratification. (30% marks)

d) Minimisation algorithm. (10% marks)

ANSWER TEMPLATE

a) Allocation concealment
Procedure for protecting the randomization process and ensuring that the clinical investigators and those involved in the conduct of the trial are not aware of the group to which the subject has been allocated

b) Block randomisation
Simple randomisation may result in *unequal treatment group sizes*; block randomisation is a method that may protect against this problem and is particularly useful in small trials.

In the context of a trial evaluating drug A or drug B and with block sizes of 4, there are 6 possible blocks of randomisation: AABB, ABAB, ABBA, BAAB, BABA, BBAA.

One of the 6 possible blocks is selected randomly, and the next 4 study participants is assigned according to the order of the block. The process is then repeated as needed to achieve the necessary sample size.

c) Stratification
Stratification is a process that protects against *imbalance in prognostic factors*/*confounders* that are present at the time of randomisation.

A separate randomisation list is generated for each prognostic subgroup. Usually limited to 2-3 variables because of increasing complexity with more variables.

d) Minimisation algorithm
This is an alternative to stratification for *maintaining balance in several prognostic variables*.

The minimisation algorithm maintains a running total of the prognostic variables in patients that have already been randomised and then subsequent patients are assigned using a weighting system that minimizes imbalance in those prognostic variables.

Maximum Score	8.5
Percentage Passed	49.3%

Question 7

7.1

The following arterial blood gas results are from a 72-year-old male admitted for investigation of nausea, vomiting and severe abdominal pain. He has a history of type 2 diabetes and atrial fibrillation.

a) Comment on the abnormalities on this arterial blood gas. (15% marks)

b) List <u>five</u> likely causes for the acid-base disturbance. (15% marks)

Parameter	**Patient Value**	**Adult Normal Range**
FiO_2	0.6	
pH	6.98*	7.35 – 7.45
pO_2	92 mmHg (12.3 kPa)	
pCO_2	31.0 mmHg (4.1 kPa)*	35.0 – 45.0 (4.6 – 6.0)
SpO_2	99%	
Bicarbonate	7.0 mmol/L*	22.0 – 26.0
Base Excess	-22.0 mmol/L*	-2.0 – +2.0
Lactate	14.5 mmol/L*	0.5 – 1.6
Sodium	146 mmol/L*	135 – 145
Potassium	5.3 mmol/L*	3.5 – 5.0
Chloride	103 mmol/L	95 – 105
Glucose	7.7 mmol/L*	3.5 – 6.0
Creatinine	711 µmol/L*	60 – 110
Haemoglobin	108 g/L*	135 – 180

7.2

A 44-year-old patient is admitted post thyroidectomy for Graves' disease. Seven years ago, she had gastric bypass surgery for obesity. Shortly after admission, her serum biochemical findings are:

Parameter	**Patient Value**	**Adult Normal Range**
Sodium	136 mmol/L	135 – 145
Potassium	5.0 mmol/L	3.5 – 5.0
Chloride	103 mmol/L	95 – 105
Bicarbonate	23.0 mmol/L	22.0 – 26.0
Glucose	5.8 mmol/L	3.5 – 6.0

Urea	5.5 mmol/L	3.0 – 8.0
Creatinine	80 µmol/L	45 – 90
Magnesium	0.60 mmol/L*	0.75 – 0.95
Albumin	35 g/L	35 – 50
Protein	74 g/L	60 – 80
Total bilirubin	12 µmol/L	< 26
Aspartate aminotransferase (AST)	34 U/L	< 35
Alanine aminotransferase (ALT)	40 U/L*	< 35
Alkaline phosphatase (ALP)	188 U/L*	30 – 110
γ-Glutamyl transferase (GGT)	45 U/L*	< 40
Calcium corrected	1.80 mmol/L*	2.12 – 2.62
Phosphate	0.7 mmol/L*	0.8 – 1.5

a) Give <u>two</u> potential explanations for the abnormalities seen. (10% marks)

b) What clinical features might be associated with these abnormalities? (20% marks)

c) Outline your management. (40% marks)

ANSWER TEMPLATE

7.1
a)
Elevated Aa gradient
Profound lactic acidosis
High Anion Gap Metabolic Acidosis (36)
Associated respiratory acidosis or incomplete compensation
Delta ratio 1.41 – suggests pure elevated anion gap acidosis
Renal impairment

b)
Metformin induced
Ischaemic gut
Pancreatitis
Sepsis
Cardiogenic shock

7.2

a) Give two potential explanations for the abnormalities seen.
Vit. D deficiency
Hypoparathyroidism

b) What clinical features might be associated with these abnormalities
Hypocalcaemia is classically associated with
Paraesthesias in perioral and acral areas
Chvostek and Trosseau's signs
Muscle cramps, laryngeal spasm
Irritability, confusion, seizures
Prolonged QT, arrhythmias

Hypomagnesaemia – some of above, also muscle weakness
Hypophosphatemia – mild, unlikely to be associated with clinical features

c) Briefly describe how you will manage this condition
IV Cal chloride or gluconate, IV Magnesium PO4 replacement
Monitor ionised Ca level, if available. Check ECG for prolonged QT
Avoid alkalosis – as it worsens neuromuscular irritability
Oral Vitamin D3 (cholecalciferol) as soon as oral intake is allowed
Oral Cal supplement (up to 1.5 – 2.0 grams/day) – preferable as Ca citrate Not Ca carbonate
Oral Magnesium supplements
If recalcitrant hypoCa, consider s/c parathyroid hormone (confirm adequate vit D level)
Check TFT, TSH – replacement T4 as needed.

Maximum Score	7.7
Percentage Passed	59.7%

Question 8

A 67-year-old male is admitted to ICU with a 5-day history of increasing shortness of breath, non-productive cough and acute respiratory failure. He has a background of COPD with a long history of smoking. He is not on home oxygen therapy. Recent pulmonary function tests have demonstrated a severe non-reversible obstructive pattern of impairment.

He has been on non-invasive ventilation (NIV) for 2 hours.

Discuss in detail how you would make a decision about whether to offer invasive mechanical ventilation to this patient, should he fail the trial of NIV.

ANSWER TEMPLATE

Broad overview
The decision to ventilate severe COPD requires careful consideration, especially in patients who may be near-end-stage lung disease. Quality of life in such patients may not justify aggressive treatment. This decision hinges on a firm understanding of the outcome of ARF in COPD.

Factors to be considered
Severity of COPD based on Spirometry, lifestyle score, dyspnea score
Patient/surrogate wishes/ advance directives
Presence of severe comorbidities especially cardiovascular and malignancy
Cause of the exacerbation e.g. PE, presence of overlap syndrome (COPD + OSA)
Previous respiratory specialist opinion e.g. severe disease, or transplant candidate

Description of above factors

Conclusion
Difficult decision
IMV if unsure and change to terminal care
Global score

Sample Answer
The decision to ventilate severe COPD requires careful consideration, especially in patients who may be near-end-stage lung disease. Quality of life in such patients may not justify aggressive treatment. This decision hinges on understanding of the outcome of ARF in COPD. Patients with COPD requiring IMV have a hospital mortality of up to 25%, rising to 33% in those needing IMV after failing NIV (Chandra et al AJRCCM 2012, Roberts et al, Thorax 2010).

This man has an acute exacerbation of severe COPD. I would base my decision to invasively ventilate this man on the following factors:

a) **Severity of COPD**, based on spirometry, life style score and dyspnoea scores

The global initiative for Obstructive lung disease (GOLD) criteria for severity of COPD based on spirometry results help with decision making and prognosis. This criterion takes into account FEV1/FVC % (all less than 70%) and % of predicted FEV1 (>80, 80-50, 50-30, <30%) to classify COPD severity into four groups. This man would classify as GOLD 4 (very severe) and have a high long-term mortality.

BODE index - based on body mass index (<21/>21), MRC dyspnea score (1 to 4, where 4 is extreme dyspnea on getting dressed, housebound), six-minute walk distance (score 0 to 3, where 3 is <150 m) and FEV1 % predicted (>65 to <35, score 0-3). 4-year survival for those scoring 7-10 in total is only 20% and likely to have even poorer survival if offered IMV.

A life style score of 3 (housebound) or 4 (bedbound/chair bound) had a very poor prognosis (Menzies et al Chest1989) and would be difficult to justify IMV in this group.

b) **cause of ARF**: bronchitis causing an exacerbation has a better prognosis than that due to LV failure, PE or pneumonia and this will be taken into account in the decision process.

c) **severe cardiovascular comorbidities** such as unstable angina, severe IHD refractory to medical therapies, NYHA class 3-4 heart failure would have a high mortality despite aggressive therapy, as would occult or overt malignancy.

d) **existing advance directives** and the ability to have a frank discussion with patient surrogates would impact on the decision to proceed to IMV

e) **pre-existing assessment and ongoing follow-up by respiratory physicians** will inform the decision to offer IMV. Existing opinions formed during a stable state precluding IMV is helpful. Similarly, ongoing smoking and non-engagement with rehabilitation services would make a decision to offer IMV tenuous. The opposite scenario and future possibility of transplant surgery may sway the decision to IMV. A documented trajectory of multiple frequent admissions for acute exacerbations with deteriorating function would affect the decision.

In summary, this is often a difficult decision. A decision to offer IMV would be carefully considered, collaborative and based on a through collateral history, examination and perusal of existing referrals and specialist documents. In the event of having to make a precipitous decision, I would err on the side of offering IMV to buy time for a more considered decision and planned cessation of IMV (terminal or otherwise).

Descriptions of scoring systems and level of detail in template were not expected. Important points from template are bolded.

Maximum Score	7.5
Percentage Passed	65.7%

Question 9

9.1

A 60-year-old male was admitted after an argument with his partner who found him, 2 hours later, unconscious in his workshop, having likely ingested an unknown substance with empty liquid bottles around him.

a) Describe the significant abnormalities in the results below. (20% marks)

Parameter	**Patient Value**	**Adult Normal Range**
FiO_2	1.0	
pH	7.04*	7.35 – 7.45
pO_2	452 mmHg (60.3 kPa)	
pCO_2	38.0 mmHg (5.07 kPa)	35.0 – 45.0 (4.60 – 6.00)
SpO_2	95%	
Bicarbonate	10.0 mmol/L*	22.0 – 26.0
Base Excess	-18.0 mmol/L*	-2.0 – +2.0
Lactate	15.0 mmol/L*	0.5 – 1.6
Sodium	141 mmol/L	135 – 145
Potassium	2.9 mmol/L*	3.5 – 5.0
Chloride	99 mmol/L	95 – 105
Bicarbonate	10.0 mmol/L*	22.0 – 26.0
Glucose	22.4 mmol/L*	3.5 – 6.0
Urea	4.7 mmol/L	3.0 – 8.0
Creatinine	97 µmol/L*	45 – 90
Magnesium	1.10 mmol/L*	0.75 – 0.95
Albumin	44 g/L	35 – 50
Protein	66 g/L	60 – 80
Total bilirubin	7 µmol/L	< 26
Aspartate aminotransferase (AST)	98 U/L*	< 35
Alanine aminotransferase (ALT)	20 U/L	< 35
Alkaline phosphatase (ALP)	65 U/L	30 – 110
γ-Glutamyl transferase (GGT)	113 U/L*	< 40
Calcium corrected	2.08 mmol/L*	2.12 – 2.62
Phosphate	1.78 mmol/L*	0.80 – 1.50
Creatinine Kinase	66 U/L	55 – 170
Osmolality	382 mOsm/kg*	275 – 295

9.2

A 32-year-old female has been admitted to the ICU following an emergency response call for generalised tonic clonic seizures and obtundation. No past history is available. Non-contrast CT brain scan is normal. The following results are obtained:

Parameter	**Patient Value**	**Adult Normal Range**
Sodium	143 mmol/L	135 – 145
Potassium	3.0 mmol/L*	3.5 – 5.0
Chloride	116 mmol/L*	95 – 105
Bicarbonate	15.0 mmol/L*	22.0 – 26.0
Glucose	5.2 mmol/L	3.5 – 6.0

Urea	12.4 mmol/L*	3.0 – 8.0
Creatinine	202 µmol/L*	45 – 90
Magnesium	0.75 mmol/L	0.75 – 0.95
Albumin	14 g/L*	35 – 50
Protein	49 g/L*	60 – 80
Total bilirubin	35 µmol/L*	< 26
Aspartate aminotransferase (AST)	58 U/L*	< 35
Alanine aminotransferase (ALT)	50 U/L*	< 35
Alkaline phosphatase (ALP)	145 U/L*	30 – 110
γ-Glutamyl transferase (GGT)	45 U/L*	< 40
Ionised calcium	1.90 mmol/L*	1.10 – 1.35
Calcium corrected	2.90 mmol/L*	2.12 – 2.62
Phosphate	1.8 mmol/L*	0.8 – 1.5
Creatinine Kinase	356 U/L*	55 – 170
Lactate dehydrogenase	450 U/L*	120 – 150
Haemoglobin	75 g/L*	120 – 160
White Cell Count	20.0 x 10^9/L*	4.0 – 11.0
Platelet count	60 x 10^9/L*	150 – 350

a) List <u>three</u> differentials for the above-mentioned clinical presentation and pathology results. (30% marks)

b) List <u>three</u> further pathology tests that would aid your diagnosis. (30% marks)

9.3

A previously healthy 24-year-old male has been admitted to your ICU with a pelvic fracture following a motor vehicle accident. He has been haemodynamically stable. The following results are obtained:

Parameter	**Patient Value**	**Adult Normal Range**
Sodium	142 mmol/L	135 – 145
Potassium	3.8 mmol/L	3.5 – 5.0
Chloride	102 mmol/L	95 – 105
Bicarbonate	22.0 mmol/L	22.0 – 26.0
Glucose	5.9 mmol/L	3.5 – 6.0
Urea	41.0 mmol/L*	3.0 – 8.0
Creatinine	520 µmol/L*	45 – 90
Magnesium	0.81 mmol/L	0.75 – 0.95
Albumin	42 g/L	35 – 50
Protein	63 g/L	60 – 80
Total bilirubin	9 µmol/L	< 26
Aspartate aminotransferase (AST)	21 U/L	< 35
Alanine aminotransferase (ALT)	15 U/L	< 35
Alkaline phosphatase (ALP)	34 U/L	30 – 110
γ-Glutamyl transferase (GGT)	21 U/L	< 40
Ionised calcium	1.14 mmol/L	1.10 – 1.35
Calcium corrected	2.40 mmol/L	2.12 – 2.62
Phosphate	1.1 mmol/L	0.8 – 1.5
Creatinine Kinase	180 U/L*	55 – 170

a) What is the likeliest diagnosis? (20% marks)

ANSWER TEMPLATE

9.1

a) Describe the significant abnormalities in the results. (2 marks)

(a) Elevated A-a Gradient (214mmHg)
(b) HAGMA
(c) Respiratory acidosis (or incomplete compensation)
(d) Delta ratio 1.4 (uncomplicated HAGMA)
(e) Lactic Acidosis
(f) High Osmolar Gap (65)
(g) Hyperglycaemia
(h) Hypokalemia

9.2

a)

- Thrombotic thrombocytopenic purpura
- HELLP syndrome
- Septic -meningo-encephalitis
- Drug - induced
- Vasculitis
- Malignancy

b)

- Blood film for schistocytosis
- Blood cultures/lumbar puncture
- Vasculitic screen
- Serology for pneumococcus/meningococcus
- Pregnancy test

9.3

a) Ruptured bladder

Examiners Comments:

Generally, these questions were answered well. Those candidates that failed, missed all or part of the question or misinterpreted what was being asked, reiterating how important it is to read the question and understand what is required before starting to answer.

Maximum Score	9.6
Percentage Passed	79.1%

Question 10

With regard to posterior reversible leukoencephalopathy syndrome (PRES), outline the risk factors, clinical features, differential diagnoses, radiological findings and management.

ANSWER TEMPLATE

Clinical features:
Onset acute – days/weeks
Headache
Encephalopathy -fluctuating conscious level to coma
Hypertension
Seizures
Visual deficits

Risk factors:
Hypertension
Cytotoxic therapy
Eclampsia
Renal disease
Autoimmune disorders
Transplantation

Differential diagnoses
CVA
Encephalitis
Migraine
Demyelinating conditions
Vasculitis

Radiological findings:
Vasogenic oedema in the posterior circulation territories on MRI

Management:
Aggressive blood pressure control
Cease any precipitating agents
Antiseizure medication

Maximum Score	8.0
Percentage Passed	79.1%

Question 11

A 42-year-old male is admitted to your ICU day 4 post-induction chemotherapy for acute promyelocytic leukemia (AML-M3). The patient was initially treated with idarubicin and all-trans retinoic acid (ATRA). He has progressively become more dyspnoeic in the ward. A chest X-ray demonstrates a bilateral, diffuse pulmonary infiltrate.

Initial examination reveals:

Respiratory Rate	40 breaths/min, SpO_2 88% on 10 L/min O_2 by face mask
Glasgow Coma Scale	14 (E4 M6 V4)
Temperature	38.9ºC
Heart rate	144 beats/min
Blood pressure	95/50 mmHg

Full blood count is as follows on admission:

Parameter	Patient Value	Adult Normal Range
Haemoglobin	88 g/L*	135 – 180
White Cell Count	26.0 x 10^9/L* (no differential)	4.0 – 11.0
Platelets	22 x 10^9/L*	150 – 400
Comment: Blasts visible		
International normalised ratio (INR)	3.2	

a) Give your differential diagnosis for his respiratory failure. (40% marks)

b) What are the major issues in this patient and how would you manage them? (60% marks)

ANSWER TEMPLATE

Differential for respiratory failure

Infection

*common CAP/HAP bacteria

*resistant organisms/less virulent bacteria (given immunosuppression, hospitalisation)

*PJP/toxoplasmosis (although probably not yet immunosuppressed for long enough)

*fungal

*viral

Non-infective

*Differentiation syndrome (previously called ATRA syndrome)

*Pulmonary haemorrhage

*Drug induced pneumonitis

Aspiration

TRALI

Cardiogenic pulmonary oedema

Non-cardiogenic capillary leak syndrome

Major issues and management

During early phase there is usually DIC and high risk of haemorrhage (especially pulmonary heamorrhage and ICH). After ATRA or ATO there is risk of differentiation syndrome. Despite this the overall prognosis is better than all other types of AML with cure rates ~90%. Hence, it would generally be appropriate to offer routine ICU supportive care (including invasive ventilation).

Specific issues and management:

1. **Infection**: seek and treat infection (usually a broad septum anti-pseudomonal B-lactam and vancomycin would be appropriate empiric antimicrobials). It is probably too early for fungal infection but there would usually be fungal prophylaxis (e.g. voriconazole or fluconazole) prescribed and viral prophylaxis prescribed (e.g. aciclovir). CMV status relevant. Septrin if PJP. Advice from haematology and ID should be sought. Cultures should be sent.
2. **Differentiation syndrome**: Steroids (e.g. dexamethasone 10 mg bd) for differentiation syndrome
3. **Coagulopathy**: Factor replacement is more aggressive given risk of bleeding from DIC (aim fib >1.5, pats >30-50).
4. **Management of respiratory failure:** Optimise oxygenation/ventilation (Invasive ventilation is not routinely avoided given overall good prognosis).
5. **Routine supportive care**. Seek and treat shock (most likely septic, other types possible (haemorrhagic, hypovolaemic, cardiogenic, obstructive). Stress ulcer prophylaxis given high dose

steroids and coagulopathy. Nutritional support – enteral feeding (oral if possible). No thrombophophylaxis required. Consultation with haematologist and ID specialist.

6. **Haematologic management:** Routine cytotoxic precautions for staff if cytotoxic (e.g. idarubicin given). WCC maybe mainly blasts and patient maybe neutropenic. Should have routine neutropaemic precautions. Role of G-CSF controversial given potential to stimulate malignant clone. Usually continue ATRA but discontinue chemotherapy.

Examiner's Comments:

Many candidates listed coagulopathy and differentiation syndrome in their differential, but few discussed the management of these problems.

Maximum Score	7.2
Percentage Passed	61.2%

Question 12

List the causes of an elevated lactate immediately following an aortic valve replacement procedure.

Outline your approach to determining the cause.

ANSWER TEMPLATE

Causes:

Pre- operative drug therapy: - metformin, linezolid, anti-retroviral therapy
Prolonged bypass time
Lactate containing priming solution
Inadequate bypass flow rates
Prolonged hypothermia
Low cardiac output post-surgery –
Tamponade,
Myocardial ischaemia/infarction,
Inadequate replacement valve function
Splanchic ischaemia
Hepatic insufficiency
High dose inotrope therapy
Measurement error
Ischaemic muscle/rhabdomyolysis
Thiamine deficiency

Determining cause

<u>History:</u>

Review patients comorbidities, and drug history
History of liver disease or alcohol/malnutrition
Review course of procedure including bypass time and any complications

<u>Examination</u>

Current infusions, including beta agonists
Evidence of poor cardiac output
Temperature
Evidence of bleeding – drain losses
Evidence of tamponade – CVP, urine output, drains

Abdominal examination for gut ischaemia
Signs of liver failure
Compartments for signs of muscle ischemia

Investigations
Confirm measurement with repeat
Standard haematology, coagulation and biochemistry tests including creatinine kinase – specifically for evidence of bleeding or liver failure
CXR – evidence of bleeding
ECHO if suspicion of tamponade/valve failure
CT /USS abdomen if suspicion of gut ischaemia/hepatic failure
Red cell transketolase if thiamine deficiency suspected

Examiner Comments:

Many candidates provided a general list of causes of hyperlactataemia without being specific to immediately following an aortic valve replacement. When outlining an approach to diagnosing the cause of the elevated lactate, some candidates instead outlined an approach to managing the patient

Maximum Score	7.3
Percentage Passed	46.3%

Question 13

a) List important clinical features of thyroid storm. (30% marks)

b) Outline the principles of management of myxoedema coma. (70% marks)

ANSWER TEMPLATE

a) List important clinical features of thyroid storm. 3 marks

i. Hyperpyrexia – temperature 40 - 41º C
ii. CVS – sinus tachycardia usually exceeding 140, atrial fibrillation, decompensated CCF, hypotension/shock and in extreme cases cardiac arrest.
iii. CNS – agitation, anxiety, delirium, stupor and coma.
iv. GI symptoms – diarrhoea, abdominal pain, jaundice
v. Physical exam may reveal Goiter, opthalmopathy, lid lag, tremors, warm moist skin.

b) Outline the principles of management of myxoedema coma. 7 marks

i. Establish IV access including CVC and collect blood for Investigations including thyroid function tests, BSL, electrolytes etc.
ii. Establish monitoring – arterial BP, ECG, temp, pulse oximetry etc.
iii. Airway – Intubation to protect airway and Mechanical ventilation to normal gas exchange
iv. Fluid + vasopressors as appropriate to a MAP 65-70 mmHg.
v. Passive rewarming while close monitoring of haemodynamics and temperature.
vi. slow replacement is key. IV T3 and T4 – T3 has greater biologic activity and quicker onset of action. Daily monitoring of T3 and T4 levels to avoid toxicity.
vii. IV hydrocortisone to treat possible coexisting adrenal insufficiency.
viii. IV dextrose to maintain BSL, NG feeding if possible.
ix. Consider IV antibiotic if clinical evidence of infection after collecting appropriate cultures.

x. Monitor and treat cardiac arrhythmias, coronary ischaemia

Maximum Score	6.8
Percentage Passed	41.8%

Question 14

You have taken over the care of a 22-year-old male admitted to ICU 3 days previously. He has sustained a severe isolated traumatic brain injury, including significant bilateral ocular injuries resulting in a ruptured globe on the right and traumatic third nerve palsy on the left.

Your colleagues report that the patient has stopped triggering the ventilator overnight and suspect that he might be brain dead.

Describe how you would diagnose brain death in this patient, including the options that are available.

ANSWER TEMPLATE

Ensure severity of brain injury is compatible with brain death (i.e. sufficient intracranial pathology) by reviewing relevant imaging.
Confirm that there has been a minimum of four hours observation and mechanical ventilation during which the patient has had unresponsive coma (GCS-3), no spontaneous breathing effort, absent cough/tracheal reflex.
Complete brainstem reflexes cannot be performed in this case and therefore brain death cannot be certified by clinical testing alone and will have to be determined by demonstrating absence of intracranial blood flow. However, the part of the clinical examination that can be undertaken should be performed.
Ensure that the following pre-conditions have been met in order to do limited brain death testing-
Normothermia (temperature > 35°C);
Normotension (as a guide, systolic blood pressure > 90 mmHg, mean arterial pressure (MAP) > 60 mmHg in an adult);
Exclusion of effects of sedative drugs
Absence of severe electrolyte, metabolic or endocrine disturbances
Intact neuromuscular function
Ability to perform apnoea testing
Undertake the clinical tests that can be done-
Response to painful stimulus to four limbs and trunk.
Response to pain in trigeminal nerve distribution
Gag reflex
Cough reflex
Apnoea testing
* Pupillary, corneal and cold caloric reflexes cannot be tested.
If all above reflexes absent, proceed to 4-vessel intra-arterial catheter angiography. Blood flow should not be demonstrable above the level of the carotid siphon in the anterior circulation, or above the foramen magnum in the posterior circulation
Alternatives-
Radionuclide imaging with Technetium -99m radiolabelled hexamethyl propylene amine oxime. (Tc-99mHMPAO)
Contrast CT or CT-angiography subject to specific radiologic diagnostic guidelines. (Absent enhancement bilaterally of all of the following are likely to be the most reliable early CT indicators of brain death:
middle cerebral artery cortical branches — that is beyond the Sylvian branches; P2 segment of the posterior cerebral arteries; pericallosal arteries; and internal cerebral veins)

Brain death can then be certified by 2 medical practitioners (not including the practitioner who performed the imaging investigation) who have examined the patient and have knowledge of the circumstances of the coma

Important points in the answer:
Confirmation of a diagnosis compatible with brain death
Why clinical testing will not be sufficient
Preconditions satisfied
List of clinical tests that can be performed
Details of imaging test of choice + list of 2 alternatives
Detailed radiologic features required for diagnosis on contrast CT was not required, but an indication that specific radiologic criteria exist was expected.
Confirmation with clinical testing alone was considered a fatal error.

Maximum Score	7.8
Percentage Passed	43.3%

Question 15

List the complications associated with renal replacement therapy. Consider in your answer continuous renal replacement therapy, peritoneal dialysis and chronic intermittent dialysis.

ANSWER TEMPLATE

Access related complications:
CVL risks: insertion complications/infection/disconnection/blood loss/air embolism
Fistula complications: stenosis, varices, shunt, infection, steal syndrome
Peritoneal dialysis: peritonitis
Insertion complications: bowel perforation
Pleural effusions and respiratory compromise
Ileus
Haemodynamic changes –vasodilation, hypercirculation, pericardial effusion, cardiomyopathy
Anaemia
Thrombocytopaenia
Osmolality shifts- dialysis disequilibrium
Cellular activation; Thromocytopaenia, leukocytosis
Nutrient losses
Peptides and protein loss: albumin, cytokines, hormones
Electrolyte changes: hypo/hyperkalaemia, hypo/hypernatraemia, hypomagnesaemia, hypophosphataemia., hypocalcaemia
Increased risk of infections/impaired immunity
Side effects of anticoagulation: Heparin-bleeding, hypocalcaemia
Citrate-citrate lock, hypocalcaemia
Mobility impairment/Lifestyle
Hypothermia
Adjustment of drug doses
Muscle cramps
Amyloidosis

Maximum Score	7.5.
Percentage Passed	62.7%

Question 16

With regard to fat embolism syndrome (FES), outline the precipitants, clinical features, diagnosis and management.

ANSWER TEMPLATE

Precipitants:
Trauma-related
Orthopaedic (most common)
Long bone fracture (esp femur)
Pelvic fracture
Elective Orthopaedic surgery
Non-orthopaedic
Liposuction
BM harvest/transplant
Nontrauma-related
Acute pancreatitis
Sickle cell disease

Clinical features
Typically develops 24-72 hours following insult.
Classic clinical triad (neurological, respiratory, cutaneous), none of which is specific for FES.

- Respiratory – the most common presenting feature. Dyspnoea, hypoxia, ARDS
- Neurological – confusion, reduced level of consciousness, seizure, focal deficit, retinal changes (petechiae)
- Petechial rash – usually in non-dependent areas, including neck, axillae, anterior chest, head, subconjunctiva. Only in 1/3 of cases, and often not until 3-5 days after insult.

Other – fever, thrombocytopenia, coagulation abnormalities (incl DIC), anaemia, tachycardia, myocardial depression, renal/liver dysfunction, high ESR

Diagnosis
Based on the clinical features in the setting of known precipitant
CXR may reveal bilateral patchy infiltrates
No single diagnostic test – BAL sampling for lipids has been described – no other tests shown to be useful
Several sets of diagnostic criteria proposed

Management
Prevention clearly preferable if possible – e.g. surgical timing (following fracture) and technique
Fixation of fracture
No specific therapy. Supportive only.
Steroids controversial – proposed anti-inflammatory effect but limited data to support

Maximum Score	8.0
Percentage Passed	71.6%

Question 17

Outline the causes and management of severe postpartum haemorrhage (PPH).

ANSWER TEMPLATE

Causes can be broken down into 4 main groups: the “4 T’s”

Tone: uterine atony (most common)
Trauma: Bleeding at surgical sites including episiotomy, genital tract laceration [vagina/cervix etc], uterine rupture
Tissue: Retained tissue (placenta) and/or membranes
Thrombin: Previously present or acquired maternal coagulation defect. Examples of acquired defects include those seen in severe pre-eclampsia, severe sepsis, amniotic fluid embolism, placental abruption or in the setting of massive transfusion.

Management can be broken down into initial resuscitation and specific treatment, with specific treatment having surgical and non-surgical modalities. Resuscitation and treatment should occur simultaneously.
Resuscitation
ABCDE approach. Assemble team (ICU/Anaesthesia/Obstetrics etc)
Appropriate monitoring: ECG / NIBP / Arterial line / CVC if time or indication
Large bore IV access x2
Initial resuscitation with crystalloids / 4% albumin
Activation of PPH protocol
Activation of massive transfusion protocol / Use O neg blood (but likely to know blood group already and use group specific blood) early if no X matched blood available
No specific Hb triggers for when to use blood, suggested after no more than 30mls/kg resusc fluids or evidence of ongoing bleeding
Other products as required: NBA Obstetric guidelines suggest FFP 15mls/kg, platelets 1 pooled bag, cryoprecipitate 3-4g (8-10 bags): use local protocols if possible and involve specialist Haematologist. Keep fibrinogen >2.0 or replace if dropping (normal in pregnancy 4-6g/L: use cryoprecipitate or fibrinogen concentrate) Emphasis on early fibrinogen
Viscoelastic tests
Avoid hypothermia, hypocalcaemia and acidosis

Non-Surgical Treatment
Bimanual uterine compression
Pharmacological Therapy (uterotonics): oxytocin, misoprostol, prostaglandin F2 alpha
Tranexamic Acid (TXA): [the WOMAN trial showed a substantial mortality benefit if given within 3 hours]
Balloon tamponade (Bakri balloon)
Vaginal/Uterine packing
Interventional Radiology: selective arterial embolization/balloon tamponade
Consider Factor VIIa as rescue therapy

Surgical treatment
EUA: repair of lacerations / evacuation of retained placental fragments etc
Laparotomy: Uterine or iliac artery ligation, B-lynch brace suture
Pelvic packing
Aortic compression / X clamp
Hysterectomy

Maximum Score	7.0
Percentage Passed	67.2%

Question 18

18.1

A previously well 23-year-old male has been an inpatient on your ICU for six days following an isolated traumatic brain injury. He has been extremely agitated and required constant infusions of propofol and

fentanyl. A full workup has confirmed there are no other injuries, and he has been stable from a haemodynamic, respiratory and metabolic standpoint since admission. This morning he has become hypotensive, and the following results are available.

a) List the significant abnormalities. (30% marks)

b) What is the likeliest diagnosis? (10% marks)

Parameter	**Patient Value**	**Adult Normal Range**
FiO_2	0.4	
pH	7.16*	7.35 – 7.45
pO_2	120 mmHg (16 kPa)	
pCO_2	35.0 mmHg (4.7 kPa)	35.0 – 45.0 (4.6 – 6.0)
SpO_2	97%	
Bicarbonate	12.0 mmol/L*	22.0 – 26.0
Base Excess	-15 mmol/L*	-2.0 – +2.0
Lactate	9.2 mmol/L*	0.5 – 1.6
Sodium	145 mmol/L	135 – 145
Potassium	6.3 mmol/L*	3.5 – 5.0
Chloride	98 mmol/L	95 – 105
Bicarbonate	12.0 mmol/L*	22.0 – 26.0
Glucose	10.2 mmol/L*	3.5 – 6.0
Urea	6.7 mmol/L	3.0 – 8.0
Creatinine	70 µmol/L	45 – 90
Creatinine Kinase	43,500 U/L*	55 – 170

18.2

You are performing clinical brain death testing on a 63-year-old male. Two arterial blood gas (ABG) results are presented below. ABG 1 was performed immediately prior to testing, and ABG 2 was performed at the end of the apnoea test.

a) Comment on the implication these results have for diagnosing brain death in this patient. (20% marks)

Parameter	**Patient Value**		**Adult Normal Range**
	ABG 1	**ABG 2**	
FiO_2	0.4	1.0	
pH	7.41	7.32*	7.35 – 7.45
pO_2	110 mmHg (14.7 kPa)	148 mmHg (19.7 kPa)	
pCO_2	49.0 mmHg (6.5 kPa)*	62.0 mmHg (8.3 kPa)*	35.0 – 45.0 (4.6 – 6.0)
SpO_2	96%	97%	
Bicarbonate	30.0 mmol/L*	31.0 mmol/L*	22.0 – 26.0
Base Excess	5.3 mmol/L*	4.9 mmol/L*	-2.0 – +2.0
Lactate	1.8 mmol/L*	1.8 mmol/L*	0.5 – 1.6
Sodium	151 mmol/L*	152 mmol/L*	135 – 145
Potassium	4.2 mmol/L	4.1 mmol/L	3.5 – 5.0
Chloride	103 mmol/L	102 mmol/L	95 – 105
Glucose	7.5 mmol/L*	8.1 mmol/L*	3.5 – 6.0

18.3

A 28-year-old female has presented with a severe asthma attack. She is 26 weeks pregnant.

a) Comment on her arterial blood gas result shown below. (40% marks)

Parameter	Patient Value	Adult Normal Range
FiO_2	0.6	
pH	7.31*	7.35 – 7.45
pO_2	120 mmHg (16 kPa)	
pCO_2	42.0 mmHg (5.6 kPa)	35.0 – 45.0 (4.6 – 6.0)
SpO_2	98%	
Bicarbonate	20.0 mmol/L*	22.0 – 26.0
Base Excess	-4.9 mmol/L*	-2.0 – +2.0
Lactate	3.0 mmol/L*	0.5 – 1.6
Sodium	136 mmol/L	135 – 145
Potassium	3.2 mmol/L*	3.5 – 5.0
Chloride	105 mmol/L	95 – 105
Glucose	8.1 mmol/L*	3.5 – 6.0

ANSWER TEMPLATE

18.1

a)
High anion gap metabolic acidosis
Associated respiratory acidosis
Delta ratio 1.9 suggesting pure HAGMA
Elevated Aa gradient
Rhabdomyolysis

b)
Diagnosis:
Propofol Infusion Syndrome

18.2

a)
Although the CO2 has risen to above 60 mmHg, the pH remains above 7.3, and so brain death cannot be diagnosed. The Na of 152 does not preclude the diagnosis of brain death.

18.3

a)
Respiratory acidosis
Metabolic acidosis
Normal anion gap
High A-a gradient
Suggests imminent fatigue, as CO2 should be lower in pregnancy. The reduced bicarbonate may indicate chronic compensation for preexisting respiratory alkalosis of pregnancy.
The elevated lactate and glucose are likely secondary to B2 agonist treatment and stress response.

Maximum Score	9.0
Percentage Passed	85.1%

Question 19

A 52-year-old male is undergoing a right pneumonectomy for squamous cell carcinoma.

a) What pre-operative respiratory assessments would be helpful to assess his risks for the surgery and post-operative course? (20% marks)

b) Outline your post-operative management for this patient with regards to:

i. Analgesia

ii. Fluid management (40% marks)

Three days after the operation he re-presents to ICU with new onset shortness of breath and hypotension, requiring intubation and mechanical ventilation

c) Give a differential diagnosis for his deterioration. Outline how you would manage his ventilation. (40% marks)

ANSWER TEMPLATE

a) What pre-operative respiratory assessments would be helpful to assess his risks for the surgery and post-operative course?

- CXR and ABG's
- FEV 1 and diffusing capacity for carbon monoxide (DLCO)
- Calculated predicted postoperative (PPO) FEV 1 and PPO DLCO
- 6-minute walk test

b) Outline your management for this patient with regard to:

i. <u>Post-operative Analgesia:</u>

Multimodal approach to analgesia

- Satisfactory analgesia can be achieved with i.v. opioids; however, their beneficial effects might be counterbalanced by the risk of respiratory depression, mild attenuation of the cough reflex, and diaphragm elevation due to bowel distension.
- The Opioid-sparing effect of a Regional techniques and avoidance of possible side effects of systemic analgesics may be advantageous in increasing tidal volume and vital capacity, and improving diaphragm activity- Epidural, Para vertebral analgesia, Intrathecal and intercostal block.
- Nonsteroidal anti-inflammatory drugs, especially Ketorolac may be used to supplement opioid analgesia. These drugs work synergistically with opioids and have no respiratory depressive effects. Disadvantages include platelet and renal dysfunction. Concern over renal dysfunction in patients in whom restrictive fluid administration is the norm means NSAID's are often avoided.
- Ketamine, gabanoids
- Paracetamol at recommended doses, along with rescue doses of Tramadol, may be proposed as a valid analgesic regimen

iii. <u>Post-operative fluid management</u>

- Patients routinely extubated post op and may need minimal iv fluids
- Potential risk of postoperative lung injury with liberal fluid administration.

c)
Give a differential diagnosis for his deterioration?

- Surgical Complication:
  - Haemothorax
  - Pneumothorax
  - Prolonged air leak/Bronchopulmonary fistula
- Infectious causes
  - Aspiration pneumonia
  - Hospital acquired pneumonia
  - Empyema
- Other complication:
  - Atelectasis
  - Pulmonary oedema
  - PE

Outline how you would manage his ventilation
Mechanical ventilation may increase the risk of bronchial stump disruption, bronchopleural fistula, persistent air leakage, and pulmonary infection.

- Protective ventilatory settings with small tidal volumes (Vts) and positive end-expiratory pressure (PEEP) should be applied to reduce the risk of ventilator-induced lung injury
- Prolonged mechanical ventilation may be associated with a significant risk for pneumonia every effort should be made to promote fast weaning from invasive airways.
- Acceptable rather than normal ABG targets
- Single lung ventilation may be required if there is a bronchopulmonary fistula

Maximum Score	7.5
Percentage Passed	58.2%

Question 20

Outline the features of the Immune Reconstitution Inflammatory Syndrome (IRIS) in patients with Human Immunodeficiency Virus (HIV) infection with regards to:

a) Definition

b) Pathogenesis

c) Risk factors

d) Differential diagnosis

e) Clinical features

f) Management

ANSWER TEMPLATE

Definition:
A collection of inflammatory disorders associated with paradoxical worsening of pre-existing infectious process following initiation of antiretroviral therapy primarily in HIV-infected patients. It has also been described in patients receiving therapy for TB.

Pathogenesis:
HIV infection produces CD4+ T cell immune suppression.

HIV half-life is generally between 1-4 days

With commencement of antiretroviral therapy there is greater than 90% reduction of HIV viral burden within 1-2 weeks.

CD4+ T lymphocyte count rapidly increases over the first 3-6 weeks

Increased lymphocyte activity then leads to systemic or local inflammatory reactions at the site or sites of pre-existing infection (known or unknown)

Risk Factors:
Lower CD4 counts at time of initiation of therapy

High viral load at time of initiation of therapy

More significant response to antiretroviral therapy

Differential diagnoses
Progression of initial opportunistic infection

New opportunistic infection

Drug toxicity

Clinical features
Most patients develop symptoms within 1 week to a few months after the initiation of antiretroviral therapy. Symptoms can be localised or systemic. Features are similar to the primary infection.

Depend on the site and organism involved. Commonly:
Pneumocystis jerovicii: fever, cough, dyspnoea, hypoxia and progressive radiographic pulmonary opacification. BAL: large numbers of inflammatory cells

Cryptococcus: CNS: fever, headache, neck stiffness, photophobia. Pulmonary: lung lesions, hypoxia, respiratory failure and ARDS

TB: clinical or radiological pulmonary deterioration, lymphadenopathy, enlarging intracranial lesions

Others (any reasonable description OK): TB, MAC, CMV (uveitis), JC virus, Hepatitis B&C – worsened LFT's. with fevers, seats anorexia; Kaposi sarcoma, toxoplasmosis (CNS)

Management
Supportive
Continue antiretroviral therapy
Treat the underlying opportunistic infection
Severe symptoms = steroid therapy

Maximum Score	6.3
Percentage Passed	14.9%

Question 21

You are asked to review a confused 65-year-old female in the Emergency Department, who has presented with abdominal pain and vomiting. She has a history of ischaemic heart disease, obstructive airways disease and atrial fibrillation.

On examination she is jaundiced, mildly confused and has right upper quadrant tenderness.

Her vital signs, after 4 litres intravenous 0.9% saline, are as follows:

Temperature	39.5^{o}C
Respiratory rate	30 breaths/min
SpO_2	92% on 15 L/min O_2 via a reservoir mask
Heart rate	120 beats/min (atrial fibrillation)
Blood pressure	88/48 mmHg

An abdominal ultrasound scan shows a dilated common bile duct and enlarged gall bladder with mural oedema.

Outline your management of this patient.

ANSWER TEMPLATE

The patient is most likely to have acute ascending cholangitis, which needs rapid resuscitation and definitive treatment.

a) Admit to the intensive care unit
Provide resuscitative and organ supportive care.

- Resuscitate, Investigate and Treat simultaneously.
- Actively consider the need intubation and ventilation given her respiratory failure, confusion and haemodynamic instability,
- Central venous and arterial lines need to be inserted and monitoring commenced.

Blood taken for investigations:
FBC, Coags, UECs, LFTs, ABGs, cultures

- No further intravenous fluid bolus
- Commence vasopressor support, aiming for a MAP > 65mmHg.
- Ensure referral to gastroenterology team for further investigation and management
- Consider MRCP or abdominal CT scan if diagnosis uncertain

b) Commence broad-spectrum empiric antibiotic therapy.
Need good gram negative, gram positive and include anaerobic cover if very unwell:
Examples include:
amoxycillin and gentamicin and metronidazole
piperacillin/tazobactam

c) Source control with decompression & drainage of her biliary tract.

- By most recent international guidelines this is Grade III (severe) acute cholangitis and thus the biliary tree must be urgently decompressed and drained.
- This can be done either endoscopically (ERCP) or percutaneously.
- Open surgery is not indicated in this situation.
- **ERCP +/- sphincterotomy (provided the patients is not coagulopathic) is the gold standard and the best method of decompression and drainage.**

Examiner Comments:

Many candidates gave further fluid boluses despite the history of marginal oxygenation and previous administration of 4l crystalloid, without any assessment of likelihood of the patient being fluid responsive.

Maximum Score	9.0
Percentage Passed	76.1%

Question 22

a) Define heat stroke and describe the two forms of heatstroke, highlighting the differences between these two conditions. (20% marks)

b) Describe the clinical features of heatstroke and the biochemical and haematological changes that may occur. (40% marks)

c) Discuss the cooling strategies in heat stroke. (40% marks)

ANSWER TEMPLATE

a) Heat stroke is defined as a core body temperature usually in excess of 40ºC with associated central nervous system dysfunction in the setting of a large environmental heat load that cannot be dissipated. Classic (nonexertional heat stroke) affects elderly individuals with underlying chronic medical conditions that impair thermoregulation, prevent removal from a hot environment, or interfere with access to hydration or attempts at cooling. These conditions include cardiovascular disease, neurologic or psychiatric disorders, obesity, anhidrosis, physical disability, extremes of age, and the use of recreational drugs and certain prescription drugs. Exertional heat stroke generally occurs in young, otherwise healthy individuals who engage in heavy exercise during periods of high ambient temperature and humidity. (2 marks)

b) The first clinical signs are often neurological and may include restlessness, delirium, seizures and coma. Multiple organ involvement may occur including signs of distributive shock with a hyperdynamic profile with hypovolaemia as a consequence of dehydration and reduced organ perfusion and associated lactic acidosis. There may be hyperventilation with respiratory alkalosis and hypoxia from acute lung injury. The main biochemical abnormalities include hyperglycaemia, hypophosphataemia, raised hepatic and muscular enzymes and an elevation of acute phase proteins. The haematological findings include leucocytosis, thrombocytopenia and activation of coagulation and fibrinolysis.
(4 marks)

c) Cooling Strategies in Heat Stroke:
Methods:
Water and fan: Evaporative and convective cooling:
Body sprayed with lukewarm water and fans are used to blow air over the moist skin.

Suppression of heat:
Agitated and shivering patient can generate heat. That can be suppressed with the use of benzodiazepines (such as lorazepam, midazolam) and chlorpromazine
paralysing agents may be required

Cold water immersion:
Immersion of patient in ice water: non-invasive, rapid but makes patient monitoring difficult

Application of ice packs:

Ice packs can be placed in axillae, neck and groin: excellent method for intubated patient, poorly tolerated by non- intubated patients

Cold compressors:
Can be applied on smooth, hairless surfaces like: palms, cheeks, soles: rapid cooling

Cold thoracic, gastric and peritoneal lavage: invasive but rapid

Cooling catheters: invasive, rapid

Cooling blankets: non-invasive, can set the temperature

Cold IV fluids

Cooling recommendations are primarily based on observation studies
There is no definitive study supporting any particular approach to cooling in classic heat stroke
Pharmacological agents like dantrolene are ineffective and not indicated in heat stroke
Alcohol sponge baths should be avoided due to risk of absorption of alcohol through skin

Maximum Score	7.5
Percentage Passed	34.3%

Question 23

(Image removed from report.)

Please note: The following ECG has been recorded at 25 mm/sec and gain setting of 10 mm/mV.

23.1

A 37-year-old male has presented to the Emergency Department with a 12-hour history of central crushing chest pain. He was taken to Catheter Lab by the cardiologists who have referred him to ICU 12 hours later due to hypotension, and confusion. His ECG (ECG 23.1) is shown on page 9, and laboratory results are presented below.

Parameter	**Patient Value**	**Adult Normal Range**
FiO_2	6L Hudson Mask	
pH	7.36	7.35 – 7.45
pO_2	162 mmHg (21.6 kPa)	
pCO_2	36.7 mmHg (4.89 kPa)	35.0 – 45.0 (4.60 – 6.00)
SpO_2	99%	
Bicarbonate	20.1 mmol/L*	22.0 – 26.0
Base Excess	-4.4 mmol/L*	-2.0 – +2.0
Lactate	5.1 mmol/L*	0.5 – 1.6
Sodium	148 mmol/L*	135 – 145
Potassium	4.8 mmol/L	3.5 – 5.0
Chloride	115 mmol/L*	95 – 105
Glucose	28.0 mmol/L*	3.5 – 6.0
Aspartate aminotransferase (AST)	3252 U/L*	< 35
Alanine aminotransferase (ALT)	6378 U/L*	< 35
Alkaline phosphatase (ALP)	58 U/L	30 – 110
γ-Glutamyl transferase (GGT)	32 U/L	< 40
Prothrombin time (PT)	29.8 seconds*	12.0 – 15.0

International normalized ratio (INR)	2.9*	0.8 – 1.1
Activated Partial Thromboplastin Time (APTT)	> 170.0 seconds*	25.0 – 37.0
Creatinine	140 U/L*	45 – 90

a) Describe the ECG (ECG 23.1 on page 9) changes. (20% marks)

b) Give a rationale for the biochemical abnormalities. (20% marks)

c) What is the most likely diagnosis? (10% mark)

23.2

A 45-year-old male with a history of alcohol abuse has been intubated and ventilated following an out of hospital cardiac arrest. Forty-eight hours after admission the following results were obtained:

Parameter	**Patient Value**	**Adult Normal Range**
Sodium	134 mmol/L*	135 – 145
Potassium	3.3 mmol/L*	3.5 – 5.0
Chloride	107 mmol/L*	95 – 105
Bicarbonate	19.0 mmol/L*	22.0 – 26.0
Glucose	6.7 mmol/L*	3.5 – 6.0
Urea	5.9 mmol/L	3.0 – 8.0
Creatinine	59 µmol/L	45 – 90
Magnesium	0.79 mmol/L	0.75 – 0.95
Albumin	20 g/L*	35 – 50
Protein	54 g/L*	60 – 80
Total bilirubin	82 µmol/L*	< 26
Aspartate aminotransferase (AST)	249 U/L*	< 35
Alanine aminotransferase (ALT)	41 U/L*	< 35
Alkaline phosphatase (ALP)	124 U/L*	30 – 110
γ-Glutamyl transferase (GGT)	481 U/L*	< 55
Calcium corrected	2.26 mmol/L	2.12 – 2.62
Phosphate	0.49 mmol/L*	0.80 – 1.50
Creatinine Kinase	114 U/L	46 – 171
Lipase	19 U/L	< 60

a) Give a rationale for the results observed. (50% marks)

ANSWER TEMPLATE

23.1

a) Describe the ECG changes

Bradycardia
ST elevation in Leads II, III and aVF (inferior MI acute) also in lateral leads. ST elevation also in anterior leads, I aVL (Lateral) have ST depression.
Compete Heart Block

b) Give a rationale for the biochemical abnormalities

Metabolic acidosis with elevated Lactate, either cardiogenic shock or related to bradycardia. Lactate is relatively high considering normal pH and only minor reduction in bicarb – potentially catecholamine infusion or hepatic injury
Elevated liver enzymes AST and ALT probably associated with hepatic congestion
Elevated INR and APTT associated with hepatic congestion, or therapeutic interventions
Corrected Na is elevated, hyperglycaemia may be underlying diabetes or stress response.
Mildly elevated Creatinine 140 secondary to hypotension, and/or contrast post angiography. May also be pre-existing.

c) What is the most likely diagnosis?

Cardiogenic shock due to Acute right ventricular Infarction with hepatic congestion, or shock related to bradycardia

23.2

a)
Mild hyponatraemia and hypokalemia may be secondary to fluid therapy or diuretic treatment.
Mild acidosis may be secondary to initial ischaemic insult, or hyperchloraemic in the setting of fluid resuscitation.
Low phosphate and protein may indicate pre-existing malnutrition: risk of refeeding.
Features of liver impairment or failure with elevated total bilirubin, GGT, AST and ALT.
High AST to ALT ratio is associated with cirrhosis. rhabdomyolysis (unlikely as CK normal).
In this context both ischaemic liver damage (from out of hospital cardiac arrest) and alcoholic liver damage should be considered. However, the normal renal function may make ischaemic liver damage less likely. The high AST may reflect AMI as a precipitating factor for the arrest.

Maximum Score	8.5
Percentage Passed	67.2%

Question 24

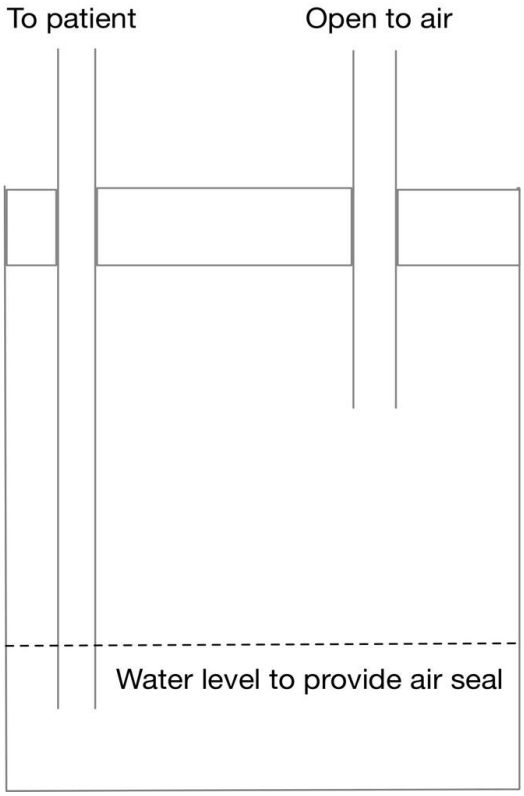
a) Draw a simple line diagram of a single chamber chest drain using an underwater seal and label the main features including the connections. List its advantages and disadvantages.
(30% marks)

b) Draw a simple line diagram of a double chamber chest drain with an underwater seal and label the main features including the connections. List its advantages and disadvantages.
(30% marks)

c) Draw a simple line diagram of a three-chamber chest drain with an underwater seal and label the main features including the connections. List its advantages and disadvantages.
(40% marks)

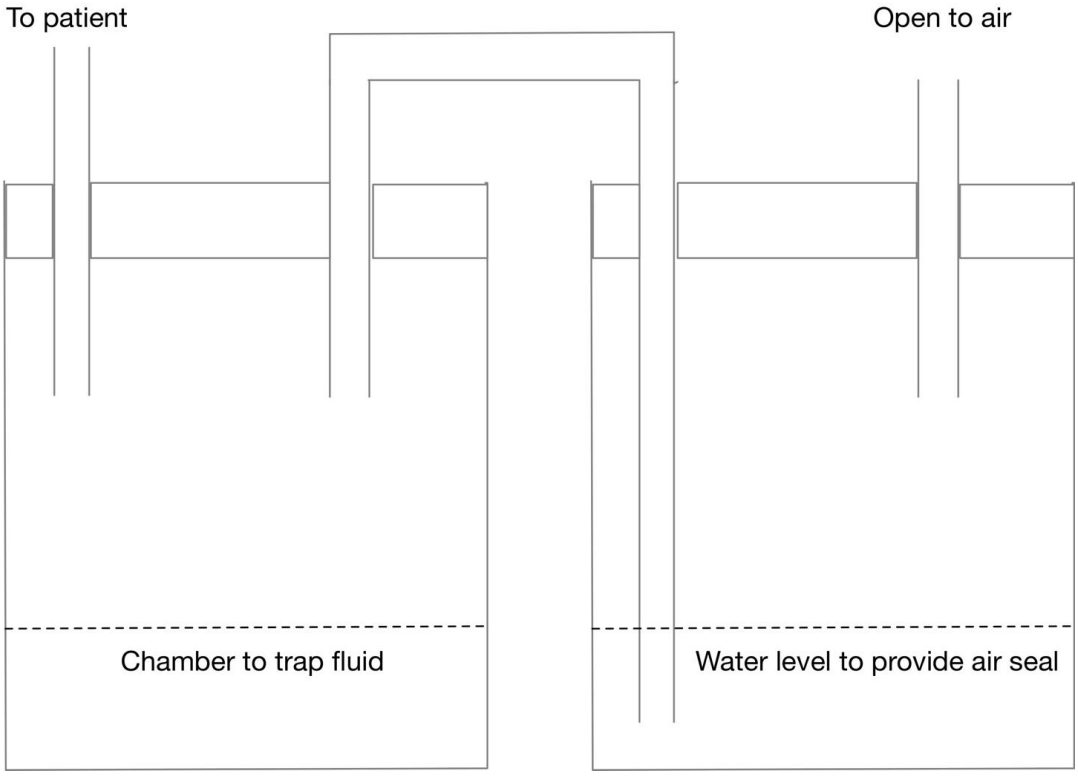
ANSWER TEMPLATE

a)



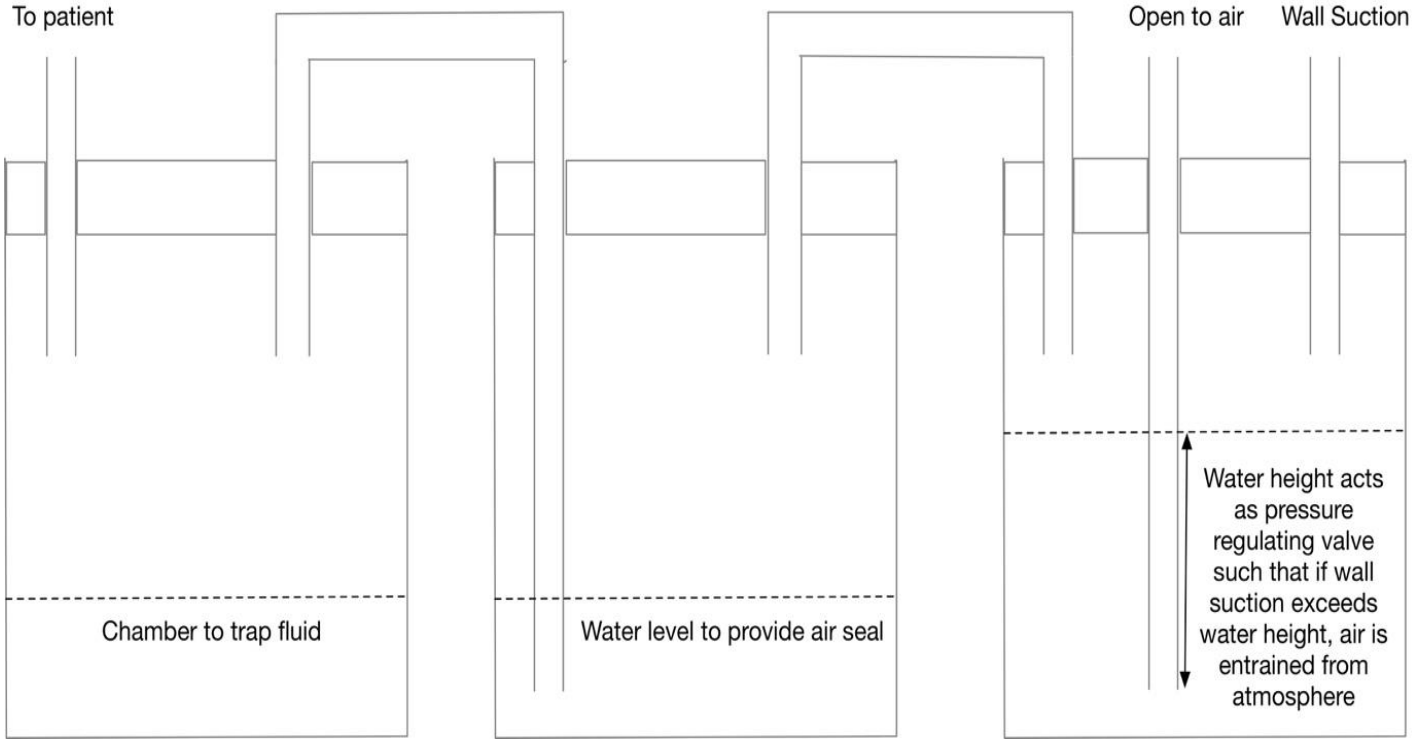
Advantages:
Simple
Drain simple pneumothoraces
Disadvantages:
Cannot drain fluid from pleural cavity safely
Cannot apply suction safely

b)



Advantages:
Drain simple pneumothoraces and fluid
Disadvantages:
Cannot apply suction safely

c)



Advantages:
Drain simple pneumothoraces and complex fluid collections
Can apply suction
Disadvantages:
Complexity and cost

Examiners Comments:

Extremely poorly done with many candidates showing a complete lack of even a basic understanding of the set up or physics of pleural drains.

Maximum Score	8.5
Percentage Passed	37.3%

Question 25

Critically evaluate the role of Decompressive Craniectomy (DC) following traumatic brain injury.

ANSWER TEMPLATE

Introduction

The main role of DC in TBI is reduction of ICP and prevention of herniation, aggravated by haematoma and brain swelling. Use of this technique is controversial and its efficacy in TBI is uncertain despite recent trials. Two main techniques widely used for DC in TBI are unilateral frontotemporoparietal craniectomy and bifrontal craniectomy

Rationale

In a decompressive craniectomy, a substantial portion of the skull is removed in order to reduce increased ICP. This can be done in combination with an evacuation procedure or as a primary treatment for increased ICP. The rationale of DC is based in the Monro-Kellie Doctrine. The skull is a rigid unexpandable structure, opening the cranial vault by DC increases the volume available to the intracranial contents and reduces ICP. Current Brain Trauma Foundation guidelines suggested the ICP lower than 20 mmHg after TBI. Patients with well-controlled ICP under the threshold appear to have improved outcomes.

Evidence
DECRA

Published by Cooper et al. in 2011- 155 patients with TBI and either GCS score lower than 8 or CT demonstrating moderate diffuse brain injury were enrolled. Patients with refractory ICP (ICP>20 mmHg for 15 minutes) within a 1-hour period were randomized to one of two groups.
DC decreased ICP and the length of stay in the intensive care unit but was associated with more patients with unfavourable neurological outcomes.
Criticisms of DECRA:
Higher ICP threshold should be used before performing DC in TBI.
The period of medical management with high ICP was too short prior to randomisation.
More patients who had non-reactive pupil were enrolled in the DC group (27%) only 12% in medical therapy group.
The choice of surgical method- only bifrontal DC without falx sectioning allowed.
No standardised rehabilitation
Long enrolment period
Less emphasis on CPP.

RESCUEicp
Multicentre (48 centre, 19 countries) RCT
408 patients (age, 10-65 years) with TBI and refractory elevated ICP (>25 mmHg) were randomized to undergo DC or receive ongoing medical care.
The primary outcome was the Extended Glasgow Outcome Scale (GOS-E) at 6 months.
At 6 months patients in DC group resulted in lower mortality and higher rates of vegetative state, lower severe disability and upper severe disability than ongoing medical care group.
The rates of moderate disability and good recovery were similar in the two groups.
Limitations
A relatively large proportion of patients in the medical group underwent DC

Pros

- Reduces ICP
- Increases survival
- Decreases ICU length of stay

Cons
ICP reduction may not necessarily result in better clinical outcomes
Potentially increased numbers of severely debilitated survivors
Surgical complications potentially include:

- Axonal stretch
- Aggravated brain oedema
- Haematoma expansion or bleeding
- Infection
- CSF leakage

- Syndrome of the trephined

Own practice
We utilise decompressive craniectomy in our unit in young patients with TBI, refractory intracranial hypertension and relatively early in their course prior to irreversible secondary injury
Clinicians and family members will need to be aware of the risks when potentially employing this strategy.
Probably useful if mass lesion (excluded in DECRA)

Summary
There is a growing body of literature with conflicting results.
Decompressive craniectomy decreases ICP and leads to improved survival. The quality of that survival is the issue, so careful procedure selection, patient population selection and overall situation appreciation are important

The level of detail of the studies given in the template was not required.

Examiners Comments:

Most candidates answered the question as asked, but several wasted efforts explaining other methods of controlling ICP or describing DC use in non-TBI situations. Candidates are reminded to read the stem carefully.

Maximum Score	7.8
Percentage Passed	67.2%

Question 26

The following question is based on the shown pulmonary function tests (PFTs). Assume in each case that the test result is adequate and reproducible.

Key:

FVC	L	Forced Vital Capacity
FEV1	L	Forced Expiratory volume in 1 second
FEV1/FVC	%	Ratio of the above
RV	L	Residual volume at end expiration
TLC	L	Total Lung Capacity
DLCO corr	ml/min/mmHg	Diffusing capacity for carbon monoxide, corrected for Hb

26.1

You are asked to evaluate a previously well, 36-year-old male who has presented to Emergency Department (ED) with shortness of breath and increased work of breathing. This has been progressive over the past week. He has had PFTs performed recently as an outpatient:

	Predicted	**Actual**	**% Predicted**	**Post Bronchodilator**	**% Change**
FVC (L)	4.20	3.15	75	3.62	+15
FEV1 (L)	3.40	2.14	63	2.56	+20
FEV1/FVC (%)	80	68		71	+4
RV (L)	2.31	3.03	131		
TLC (L)	6.41	6.53	102		

a) What pattern of abnormality is shown?

b) Should it become necessary, what implications will this have for your ventilation strategy?
(30% marks)

26.2

A 39-year-old female has presented in ED with severe, acute on chronic shortness of breath, now affecting her at rest. She has a 15-pack year history of smoking. She has had PFTs performed recently as an outpatient. Her chest X-ray shows marked bi-basal hyper-lucency.

	Predicted	**Actual**	**% Predicted**	**Post Bronchodilator**	**% Change**
FVC (L)	3.15	1.50	48	0.83	-10
FEV1 (L)	2.65	0.52	20	0.53	+2
FEV1/FVC (%)	83	54			14
RV (L)	1.49	3.13	210		
TLC (L)	4.44	4.74	107		
DLCO corr (ml/min/mmHg)	24.85	6.70	27		

a) What pattern of abnormality is shown?

b) Suggest <u>two</u> likely diagnoses. (20% marks)

26.3

A 46-year-old female has presented with several months of progressive shortness of breath and lethargy compromising her previously active lifestyle. She is markedly hypoxic, with a resting SpO_2 of 88% in air. She has had PFTs performed recently as an outpatient

	Predicted	**Actual**	**% Predicted**	**Post Bronchodilator**	**% Change**
FVC (L)	3.56	3.35	94	2.77	-6
FEV1 (L)	2.88	2.70	93	2.31	-4
FEV1/FVC (%)	81	82		83	
RV (L)	1.90	2.03	107		
TLC (L)	5.22	5.11	98		
DLCO corr (ml/min/mmHg)	23.25	7.96	34		

a) What pattern of abnormality is shown?

b) List <u>two</u> differential diagnoses. (20% marks)

26.4 – *see answer template*

ANSWER TEMPLATE

26.1

Obstructive, reversible, evidence of gas trapping but not hyperinflation (1 mark)

At risk of dynamic hyperinflation, may need high inspiratory pressures, low PEEP, long expiratory time (3 Marks)

26.2

Severe, non-reversible obstructive lung disease
Smoking related lung disease
Alpha 1 antitrypsin deficiency (2 marks)

26.3

Normal lung function, markedly impaired diffusion of gases
Problem is not in the lungs but with the blood flow i.e. pulmonary vascular disease/pulmonary hypertension
Any 2 of:

- **idiopathic or familial PAH**
- cardiac disease - L sided
- connective tissue disease /SLE
- drug induced
- **chronic thromboembolic disease** (2 marks)

Both bolded answers required for full marks in this section.

26.4 – due to a transcription error this section did not include enough information in the stem to provide an adequate answer. As a result, only answers to sections 26.1-26.3 contributed to marks for this question.

Maximum Score	8.9
Percentage Passed	76.1%

Question 27

Outline the therapeutic options with rationale for the treatment of right ventricular dysfunction in an ICU patient.

ANSWER TEMPLATE

Optimise preload:
By titrating fluid if hypovolaemic or diurese or dialyse off volume if required.
Most conditions that lead to RV dysfunction in the ICU are due to increased afterload & an enlarging RV may worsen coronary perfusion as well as impede LV filling through ventricular interdependence. Hence reducing RV excessive preload can both reduce RV stretch and function as well as improving the performance of the LV.
In those specific circumstances where RV output is impaired due to contractile dysfunction e.g. in the setting of a normal afterload, a higher preload is needed to maintain forward flow. e.g. RV infarction

Improving contractility

General measures to improve contractility:
Avoid over stretch of the RV free wall with optimisation of preload and afterload.
Maintenance of Sinus rhythm – correct electrolytes, acidaemia, use of anti-dysrhythmics, and if needed AV sequential pacing.

Pharmacological approaches:

1. Noradrenaline improves coronary perfusion in the RV but will increase pulmonary vascular resistance (PVR); however, the overall impact is that noradrenaline has been shown be helpful in RV dysfunction
2. Adrenaline improves RV contractility without increasing (PVR)
3. Milrinone (50mcg/kg bolus -> 0.2-0.8mcg/kg/min) a PD3 inhibitor improves inotropy and promotes vasodilatation (systemic and pulmonary). Can be associated with hypotension so paired with noradrenalin.
4. Dobutamine -can be paired with noradrenaline but can cause tachyarrhythmias
5. Levosimendin is a calcium sensitiser and can improve RV function in left heart disease.

Mechanical devices to support the RV: whist we treat the underlying cause. These include: ECMO; RV assist devices/Impella.

Afterload reduction

Excessive afterload plays some role in nearly all cases of acute RV failure.
Reduction best achieved by a range of general measures and specific pharmaco-therapies including pulmonary vasodilators.

General measures to improve hypoxia hypercarbia and acidosis

1. Oxygen therapy
2. Lung protective mechanical ventilation using the lowest effective plateau pressure tidal volume and PEEP whilst avoiding hypoxia and hypercarbia.

e.g. Vt 4-6ml/kg Ideal BW; minimise PEEP; $P_{plat} < 30$ mmHg; treat hypercarbia, acidosis. (PVR lowest at FRC)

3. Avoidance of hypothermia
4. Treatment of thromboembolic disease if acute cor pulmonale from PE.

Pulmonary Vasodilators

Several classes of drug in this setting and all have the potential to cause systemic hypotension and blunt hypoxic pulmonary vasoconstriction and can worsen VQ mismatch.

a) Inhaled nitric oxide 20-40ppm; rapid onset short offset short half-life is the inhaled vasodilator of choice in the critically ill. Has been shown to improve RV ejection fraction and end-diastolic volume in these patients, improve pulmonary hemodynamics and mixed venous oxygen saturation in patients with acute RV failure.

b) Inhaled prostacyclin analogues have been shown to be effective in post cardiac surgery patients with pulmonary hypertension, refractory hypoxaemia or right heart dysfunction.

Examiners' Comments:

The level of detail in template was not required. Discussion of preload optimisation, contractility and pulmonary vasodilation was required for a pass.

Maximum Score	9.0
Percentage Passed	85.1%

Question 28

With respect to Toxic Epidermal Necrolysis (TENS):

a) List the main causes. (20% marks)

b) Outline the management. (80% marks)

ANSWER TEMPLATE

a) Infections:
Viral e.g. Influenza, Coxsackie, Mumps
Bacterial e.g. GAS, Diphtheria, Mycoplasma

Drugs:
Sulfonamides
Beta-lactams
Anti-convulsants
NSAIDs
Allopurinol
Paracetamol

Malignancy

b) General:
Multi-disciplinary approach with dermatology, plastics, ophthalmology. Best managed in specialised burns unit
Stop precipitating agents e.g. NSAID / allopurinol
General Haemodynamic and respiratory support.
Reverse-Isolation in single room with room temperature increased to 30-32^{0}C.
Awareness of potentially high fluid loss: may require aggressive replacement
Wound care: Cover the denuded skin with anti-septic soaked dressings, vigilance for secondary skin infections. No role for prophylactic antibiotics.
Analgesia for painful skin lesions and for dressing change.
Eye care: look for conjunctival hyperemia, epithelial defect & pseudomembrane formation. Treat with topical lubricants, topical steroids and topical antibiotic, as guided by ophthalmology.
Attempt to place lines through normal skin if possible

Specific:
Cyclosporin: Early administration at the dose of 3-5mg/kg is beneficial and is recommended.
Steroids: The use of systemic corticosteroids has not been evaluated in clinical trials & remains controversial. Early observational studies indicated higher frequency of complications & death; but recent meta-analysis found that steroid treatment was associated with reduced risk of death. The dose, route, duration & timing of steroids remain uncertain.
Plasmapheresis: Reported to be beneficial in small series and case reports, but role still not well defined.
Anti-TNFα monoclonal antibodies e.g. infliximab has been used successfully in small series of patients, but not recommended.

Maximum Score	8.3
Percentage Passed	58.2%

Question 29

a) Define “Open Disclosure” in the healthcare setting. (10% marks)

b) Outline the general steps involved in “Open Disclosure”. (50% marks)

c) Discuss the importance of “Open Disclosure”. (40% marks)

ANSWER TEMPLATE

a)
Open Disclosure is the process of communicating with a patient and/or their support person(s) about a patient-related incident or harm caused during the process of healthcare.

b)
- Acknowledge the incident and its impact
- Explain the known clinical facts
- Apologise for what has occurred
- Provide support to staff patient and families including avenues of complaint/patients’ rights
- Reassure and agree on a plan for ongoing care
- Investigate the incident to learn what has happened.
- Feedback to patient and staff and families
- Document by incident reporting tool and in the patient’s medical record

c)
Actively and openly managing such incidents, including through the exchange of timely and appropriate information, is important for:
- The recovery process of patients and next-of-kin
- Clinicians to manage their involvement in, and recovery from, adverse events
- Health service organisations to learn from errors.

Practising open disclosure can assist health service organisations develop a reporting culture as it supports clinicians managing unintended patient harm.
Effective and timely communication, transparency and establishing a rapport with the patient and/or family along with an apology when incidents occur might mitigate potential legal action.

Maximum Score	7.0
Percentage Passed	59.7%

Question 30

a) List six clinical signs on examination that would support the diagnosis of infective endocarditis in a patient with fever and a new murmur. (30% marks)

b) List three causes of coma with bilateral miosis. (30% marks)

c) List four clinical signs of severity in chronic aortic regurgitation. (40% marks)

ANSWER TEMPLATE
a)
- Janeway lesions (small, non-tender erythematous or haemorrhagic macular or nodular lesions on the palms or soles)
- Roth spots (retinal haemorrhages with pale or white centres)
- Oslers nodes (painful, red raised lesions found on the hands and feet)

- Splinter haemorrhages
- Clubbing
- Splenomegaly
- Petechiae

b)

- Pontine lesions
- Thalamic haemorrhage
- Metabolic encephalopathy
- Organophosphate toxicity
- Other cholinergic agents (e.g. donezepil for Alzheimers) Opioids, barbituates, GHB, clonidine
- Mushroom intoxication (cholinergic effect)

c)

- Collapsing pulse/wide pulse pressure
- Length of decrescendo diastolic murmur
- LV third heart sound
- Soft A2
- Austin Flint (mid-diastolic) murmur
- Left ventricular failure
- Displaced apex beat

Maximum Score	8.5
Percentage Passed	88.1%

EXAMINERS' COMMENTS

Hot Cases

The Hot Cases run for twenty minutes with an additional two minutes at the start of each case for the candidate to be given both a verbal and a written introduction to the case in question. This is to give candidates more opportunity to take in the relevant information and to plan a focussed approach to examination of the patient.

The following comments are a guide to the expected standard for performance in the Hot Cases:

- Candidates should demonstrate professional behaviour, treating the patient with consideration and respect.
- Candidates should address and answer the question asked of them in the introduction to the Hot Case.
- Candidates should interpret and synthesise information as opposed to just describing the clinical findings.
- Candidates need to seek information relevant to the clinical case in question.
- Candidates should be able to provide a sensible differential diagnosis and appropriate management plan. A definitive diagnosis is not always expected and, in some cases, may yet to be determined.
- Candidates should not rely on a template answer or key phrases but answer questions in the context of the clinical case in question.
- Candidates must be able to describe, with justification, their own practice for specific management issues.

Candidates who performed well in the Hot Cases, as in previous exams, were able to demonstrate the following:

- A professional approach showing respect and consideration for the patient.
- Competent, efficient and structured examination technique and also able to appropriately adapt the examination to suit the clinical case in question.
- Seeking of information relevant to the case.
- Appropriate interpretation and synthesis of their findings.
- Presentation of their conclusions in a concise and systematic fashion, addressing the issue in question.
- Listing of a differential diagnosis that is relevant to the clinical case in question.
- Appropriate interpretation of relevant investigations.
- Discussion of management issues in a mature fashion, displaying confident and competent decision-making.
- An appreciation of the complexities and key issues of the case.
- Overall performance at the expected level (Junior Consultant).

Candidates who did not perform at the acceptable standard did so for reasons including the following:

- Missing or misinterpreting key clinical signs on examination.
- Failure to perform a focussed examination relevant to the case in question.
- Incomplete or poor technique for examination of a system.
- Poor synthesis of findings with limited differential diagnosis, sometimes compounded by missed key clinical signs on examination.
- Poor interpretation of imaging and data.
- Failure to grasp the key issues relevant to the case in question and a lack of insight into the problems.
- Inability to construct an appropriate management plan for the case in question.

- Hesitancy and/or uncertainty in stating a management plan.
- The need for significant prompting during the discussion with knowledge gaps.
- Limited time for discussion as a consequence of taking too long to present the clinical findings or to interpret basic data.
- Inability to convey the impression that he/she could safely take charge of the unit.

It is apparent that some candidates are very nervous, and this affects their exam performance. Candidates badly affected by nerves may benefit from sessions with a performance psychologist, drama coach, public speaking coach or similar.

Candidates are advised that they should not sit the Second Part Examination until they can confidently examine patients, present the relevant clinical findings, synthesise all the information and discuss management issues at the appropriate level, **i.e. demonstrate that they are capable of safe, effective, independent practice at the level of a Junior Consultant.** Candidates should practise Hot Cases from the commencement of their exam preparation. To this end, candidates are encouraged to do the following in their daily clinical practice as preparation for the Hot Cases:

- Seek the opportunity to take charge of the unit and be responsible for management decisions.
- Practise examination of individual systems.
- Treat every case to be assessed at work as a Hot Case, i.e. pose a relevant question (e.g. 'Why is this patient not progressing?' 'What is the cause of the new fever?' 'Is this patient ready for extubation?'), perform a focussed exam and then present your findings to a colleague.

Vivas

The overall pass rate for the vivas was 67%, compared with 70% for the written paper and 61% for the Hot Cases. Two out of the eight vivas had a pass rate under 50%. The radiology viva had a particularly low pass rate. Candidates who failed a viva mostly did so because of knowledge gaps, poorly structured answers and inability to give the rationale for their responses. As in the discussion for the Hot Cases, candidates should not rely solely on generic statements, key phrases and template answers, and, instead, tailor their responses to the specifics of the question and be able to justify and expand their response. Candidates are encouraged to practise viva technique and to discuss patient management, including the rationale for their decisions, with senior colleagues. As with the Hot Cases, candidates who are very nervous or have a poor technique may benefit from training with a performance coach.

SECOND PART ORAL EXAMINATION

CLINICALS "HOT CASES"

Flinders Medical Centre

A 62-year-old female presented with a decreased level of consciousness requiring intubation and ventilation. Background history of alcohol abuse, hepatitis C infection, frontal oligodendroglioma excision 2 years ago. Candidates were asked to identify possible causes for the reduced level of consciousness.

A 29-year-old male presented with fever, diarrhoea and shock. History was significant for hepatitis C, diabetes, kidney/pancreas transplant. Candidates were asked to discuss differential diagnosis for the presentation.

A 39-year-old female who is morbidly obese has been in the ICU for 20 days. She presented with respiratory distress and is positive for Influenza A. Candidates were asked to discuss causes for her failure to wean from the ventilator

A 71-year-old male has been in ICU for 11 days. He presented with respiratory failure. He had a previous ICU admission following a GI bleed. Candidates were asked to determine reasons for failure to wean and discuss a plan to move him forward.

A 67-year-old male presented with respiratory failure requiring invasive mechanical ventilation. He had a history of COPD and was on home oxygen and also previously had cardiac stents for ischaemic heart disease. Candidates were asked to examine to identify potential causes for his respiratory failure

A 56-year-old male was admitted following a motor vehicle accident 5 days ago. He had a history of obstructive sleep apnoea and used nocturnal CPAP at home. Candidates were asked to assess for suitability for extubation and discuss other relevant clinical issues.

An 86-year-old lady presented overnight with severe hypotension along with a 3-day history of abdominal pain and dysuria. Candidates were asked to discuss the potential causes for her hypotension and discuss other issues of concern.

A 54-year-old female presented with a decreased level of consciousness 10 days previously. She had previous surgery for right tonsillar squamous cell carcinoma. She was ventilated and haemodynamically stable. Candidates were asked to examine the relevant systems with a view to providing a differential diagnosis for her reduced level of consciousness.

Royal Adelaide Hospital

A 36-year-old woman day 8 in ICU following a motor vehicle accident. Candidates were asked to examine her and outline a management plan. Discussion points included interpretation of the CT images, management of ventriculitis and prognostication.

A 70-year-old woman found unconscious at home with a background of sleep apnoea, hypertension and obesity. Candidates were asked to examine her and outline a management plan. Discussion points included the pros and cons of extubation compared to tracheostomy, and management of blood pressure in intracranial haemorrhage.

A 64-year-old man with respiratory failure after major trauma. Candidates were asked to elicit the cause of his respiratory failure and describe their ongoing management strategy. Discussion

centered around interpretation of radiology images and arterial blood gases and the differential diagnosis of the respiratory failure.

A 26-year-old woman day 13 in ICU following a parachute accident. She had a failed extubation attempt a week before. Candidates were asked to determine the cause of the failed extubation and to describe how they would proceed.

A 49-year-old man day 16 in ICU following an overdose. Candidates were asked to determine the complications of the overdose. Discussion points included interpretation of an abdominal CT scan, features of pancreatitis, and management of feeding intolerance.

A 67-year-old man day 28 in the ICU with a background of thoracic surgery. Candidates were asked to examine him and determine why he could not be weaned from the ventilator. Discussion points included reasons for weaning failure, causes of bilateral lung infiltrates, interpretation of electrolyte levels and the candidates weaning strategy.

A 69-year-old man admitted after coronary artery bypass grafts complicated by post-operative bleeding requiring a return to theatre. Candidates were asked to assess his progress and formulate a management plan.

A 66-year-old man day 6 in ICU with hypoxic respiratory failure and a background of multiple myeloma. Candidates were asked to determine the cause for his respiratory failure. Discussion points included the differential diagnosis of bilateral lung infiltrates in immunocompromised patients, and the role of non-invasive ventilation.

A 77-year-old woman day 8 in ICU after coronary artery bypass grafts. She had a background of cognitive decline and frailty. Candidates were asked to provide a differential diagnosis for her respiratory failure. Discussion points included the causes of respiratory failure, interpretation of chest x-ray and CT findings, and causes of a raised white cell count.

A 63-year-old man day 51 in the ICU who had presented with bulbar weakness and difficulty in breathing. Candidates were asked to describe his current status and to provide a management plan. Discussion points included the diagnosis of Guillain-Barre syndrome and its differentials.

A 47-year-old man day 5 in ICU after a multi-drug overdose, with a background of idiopathic dilated cardiomyopathy, obesity and depression. Candidates were asked for their examination findings and management plan. Discussion points included assessment of fluid status and management of beta-blocker toxicity.

A 34-year-old woman day 10 ICU admitted following a cardiac arrest. She had a background history of pituitary adenoma resection and bilateral adrenalectomy. Candidates were asked to provide a management plan. Discussion points included prognostication in hypoxic-ischaemic encephalopathy, and management of severe hypothyroidism.

A 65-year-old man with an out of hospital cardiac arrest. Candidates were asked to describe his main issues and to provide a management plan.

A 30-year-old man day 2 ICU admitted after being found with a reduced level of consciousness. Candidates were asked to assess his progress

Lyell McEwin Hospital

A 58-year-old woman with chronic lung disease intubated and ventilated.

Candidates were asked to assess her clinical status, describe their clinical findings, and discuss how to progress her care. The patient was wasted with hepatomegaly, a right ventricular heave and a raised JVP and peripheral oedema

A 47-year-old woman with chronic heart failure and diabetes admitted after a fall at home. Candidates were asked why she was hypotensive and to comment on her clinical status and ongoing management. The patient was awake but drowsy and encephalopathic. There were signs of low cardiac output, pulmonary hypertension, poor skin condition and a pressure area.

A 75-year-old man day 165 in ICU with intra-abdominal sepsis and pulmonary haemorrhage, acute kidney injury and a slow ventilator wean. Candidates were asked to assess him with a view to identifying reversible issues that would facilitate his ICU discharge.
The patient had gross muscle wasting, had diminished reflexes, coarse airway noises and was awake and encephalopathic

A 61-year-old man day 46 in ICU with SOB and hypotension due to a poor ejection fraction and now a slow ventilator wean. Candidates were asked to examine him and make a plan for weaning from mechanical ventilation. The patient was awake and alert, on pressure support ventilation through a tracheostomy, with wasting and reduced reflexes.

Queen Elizabeth Hospital

A 71-year-old woman, day 11 in ICU, admitted after gamma nail fixation of a fractured neck of femur. She had a background of rheumatoid arthritis and myotonic dystrophy. Candidates were asked how her comorbidities could impact on her ICU management. Ares of discussion included the effects of neuromuscular weakness, immunosuppression and respiratory impairment.

A 55-year-old man, day 22 ICU, with respiratory failure precipitated by metapneumovirus infection. He had a background of morbid obesity and COAD. Candidates were asked for his current problems and to plan his management. Areas of discussion included the impacts of obesity on ICU management and the management of deep vein thrombosis, including the effects of heparin resistance.

A 78-year-old man, day 24 ICU, with respiratory failure after an operative procedure. Candidates were asked for his current problems and to plan his management. Relevant clinical findings included a median sternotomy, scars from a VATS procedure, a systolic murmur and lung crepitations.

VIVAS

Viva 1

You have been called to assist at the resuscitation of a 27-year-old patient in cardiac arrest on the general ward of your hospital. The patient is on the floor, with the surgical junior medical officer attempting ventilation with a bag and mask, and a nurse performing chest compressions. The patient has super morbid obesity with a BMI >60 kg/m2.

What is your approach and what are the issues that you would consider in performing resuscitation in these circumstances?

Maximum Score	7.5
Percentage Passed	56%

(This viva dealt with issues in cardiopulmonary resuscitation and subsequent management in severe obesity.)

Viva 2

A 56-year-old male is brought to the Emergency Department with trauma following a motor vehicle accident. His initial blood tests reveal the following results:

Parameter	Result	Reference Range
Bilirubin	18 µmol/L	0 – 18
Aspartate Transaminase (AST)	730 U/L *	0 – 30
Alanine Aminotransferase (ALT)	1034 U/L *	0 – 30
Alkaline Phosphatase (ALP)	130 U/L *	30 – 100
Gamma Glutamyl Transferase (GGT)	94 U/L *	0 – 35
Total protein	62 g/L	60 – 82
Albumin	36 g/L	36 – 52
Blood glucose	12.1 mmol/L *	4.0 – 6.0
International normalised ratio (INR)	1.1	

What is your interpretation of these results?

Maximum Score	9.5
Percentage Passed	46%

(This viva dealt with the management of traumatic liver injury.)

Viva 3

A 73-year-old female has been admitted following a collapse. She has a history of 3 days of anorexia, nausea, diarrhoea, vomiting and palpitations. Her past medical history includes heart failure, type 2 diabetes, atrial fibrillation, hypertension and COPD.

Her usual medications comprise Frusemide, Digoxin, Amiodarone, Metformin, Aspirin, Omeprazole, Atorvastatin, and Salbutamol inhaler.

Her initial observations are as follows:

- Heart Rate 51 bpm
- Blood Pressure 100/65 mmHg
- Respiratory Rate 30/min
- Oxygen saturation on air 93%

Initial blood results from Emergency Department are shown below:

Parameter	Result	Reference Range
Hb	110 g/L*	120 – 160
White Cell Count	14.9 x 10^9/L*	4.0 – 11.0
Platelets	100 x 10^9/L*	150 – 400
Sodium	148 mmol/L*	135 – 145
Potassium	6.5 mmol/L*	3.5 – 5.0
Urea	29.5 mmol/L*	2.4 – 7.5
Creatinine	223 µmol/L*	45 – 90
Glucose	3.5 mmol/L	3.5 – 7.7
Lactate	7.1 mmol/L*	0.5 – 1.6

Outline your differential diagnosis and discuss the investigations that you would order.

Maximum Score	8.5
Percentage Passed	74%

(This viva dealt with the management of digoxin toxicity.)

Viva 4

You are asked to urgently review a 72-year-old male with a BMI of 40 who was recently admitted to ICU following an apparently uneventful elective right carotid endarterectomy. He is complaining of shortness of breath and is refusing to lie flat.

He has the following observations:

- SpO_2 93% on 15L O_2
- Stridor and respiratory rate of 40/min
- Heart rate 120 bpm
- Blood pressure 200/110 mmHg

Describe your immediate management priorities.

Maximum Score	9.5
Percentage Passed	63%

(This viva dealt with the management of acute upper airway obstruction.)

Viva 5

You have been called to review a 66-year-old male in the Emergency Department. He fell from a height and was admitted complaining of neck pain and weakness in all four limbs.

He was intubated shortly after admission for rapid shallow breathing and hypoxia. His current BP is 75/40 mmHg.

Describe your management.

Maximum Score	8.3
Percentage Passed	70%

(This viva dealt with spinal injury.)

Viva 6 – Procedure Station

This is a procedure station.

You will be asked to describe how to perform percutaneous tracheostomy.

You will also be asked about contra-indications and complications of percutaneous tracheostomy.

Maximum Score	9.5
Percentage Passed	81%

(This viva dealt with insertion of percutaneous tracheostomy.)

Viva 7 – Radiology Station

Maximum Score	7.7
Percentage Passed	30%

(The radiology station consisted of three plain x-rays and five CT studies.)

Viva 8 – Communication Station

Mr John Smith was an independent, 80-year-old male admitted 10 days ago with profound sepsis in the context of pancreatitis. Imaging has revealed a suspicious lesion in the head of his pancreas which is likely to be malignant, although he has not had a tissue diagnosis yet.

John is in established multi-organ failure with severe ARDS, circulatory failure on very high doses of vasopressors (Noradrenaline dose 50 ug/min and Vasopressin dose 0.04 u/min) and on renal replacement therapy. You are seeing him today on your first day of a clinical week.

Medical consensus is that he has irretrievable multi system organ failure and that he is unlikely to survive. Medical recommendation is in favour of transitioning care from a curative to a palliative intent. Vitamin C administration was considered but not undertaken.

The Intensivist who looked after the patient previously has been updating family on early severe illness but has yet to initiate discussions on end of life. His son Kevin, and daughter Kylie are John's next of kin.

You're about to meet Kevin and Kylie to initiate a conversation on John's end of life care.

Maximum Score	9.0
Percentage Passed	50%