



# COLLEGE OF INTENSIVE CARE MEDICINE OF AUSTRALIA AND NEW ZEALAND

## SECOND PART EXAMINATION

### EXAM REPORT MARCH / MAY 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	May 2018	October 2017	May 2017	October 2016	May 2016	October 2015
Presenting for written (Including OTS)	49	49	40	49	41	52
Carrying a pass from a previous attempt	11	8	9	14	14	12
OTS Exempt	0	0	0	0	0	0
Total number presenting (written + carry + OTS)	60	57	49	63	55	64
Invited to orals (>50% in written section)	28	39	24	34	27	35
Total number invited to oral section	38	47	33	48	41	47

<b>Analysis of Performance in Individual Sections</b>	<b>May 2018</b>	<b>October 2017</b>	<b>May 2017</b>	<b>October 2016</b>	<b>May 2016</b>	<b>October 2015</b>
Successful in the written section	28/49 57%	39/49 80%	24/40 60%	34/49 69%	27/41 66%	35/52 67%
Successful in the Hot Case section	23/38 61%	33/47 70%	15/33 45%	33/48 69%	18/41 44%	26/47 55%
Successful in both Hot Cases	11/38 29%	18/47 38%	11/33 33%	24/48 50%	7/41 17%	13/47 28%
Successful in the Viva section	31/38 82%	36/47 77%	24/33 73%	38/48 79%	18/41 44%	31/47 66%

<b>Sectional Pass Rates</b>	<b>May 2018</b>		<b>October 2017</b>		<b>May 2017</b>		<b>October 2016</b>		<b>May 2016</b>		<b>October 2015</b>	
	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	58%	85%	60%	100%	42%	90%	65%	93%	37%	80%	45%	80%
Hot Case 2	58%	90%	62%	98%	55%	95%	65%	90%	46%	90%	62%	85%
Viva 1	76%	95%	64%	90%	73%	85%	65%	88%	71%	92%	53%	93%
Viva 2	87%	100%	30%	68%	73%	90%	67%	85%	32%	70%	45%	88%
Viva 3	87%	100%	51%	83%	55%	71%	77%	95%	66%	90%	77%	85%
Viva 4	71%	98%	62%	83%	73%	93%	46%	90%	51%	80%	79%	78%
Viva 5	50%	80%	79%	100%	70%	77%	44%	95%	76%	85%	66%	85%
Procedure Viva	53%	90%	45%	78%	73%	90%	79%	100%	66%	85%	40%	90%
Radiology Viva	76%	97%	66%	95%	73%	94%	100%	92%	41%	89%	40%	95%
Communication Viva	53%	84%	91%	100%	52%	95%	60%	95%	10%	85%	47%	78%

Oral Section Pass Rates	May 2018	October 2017	May 2017	October 2016	May 2016	October 2015
Candidates who scored >50% in written section and passed the overall exam	22/28 <b>79%</b>	30/39 <b>77%</b>	17/24 <b>71%</b>	25/34 <b>74%</b>	15/27 <b>56%</b>	27/35 <b>77%</b>
All candidates invited to oral section and passed the overall exam (written + carry + OTS)	30/38 <b>79%</b>	37/47 <b>79%</b>	21/33 <b>64%</b>	39/48 <b>81%</b>	18/41 <b>44%</b>	32/47 <b>68%</b>
Overall Pass Rate	30/60 <b>50%</b>	37/57 <b>65%</b>	21/49 <b>43%</b>	39/63 <b>62%</b>	18/55 <b>33%</b>	32/64 <b>50%</b>

### EXAMINERS' COMMENTS

#### Written Paper

The pass rate for the written section was lower than in previous years. Eleven of the thirty questions had pass rates below 50%. Questions dealing with evidence-based medicine, subarachnoid haemorrhage grading, stress ulcer prophylaxis and infection control issues 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

<b>Critically evaluate:</b>	Evaluate the evidence available to support the hypothesis
<b>Outline:</b>	Provide a summary of the important points
<b>List:</b>	Provide a list
<b>Compare and contrast:</b>	Provide a description of similarities and differences (E.g. Table form)
<b>Management:</b>	Generic term that implies overall plan. Where appropriate, may include diagnosis as well as treatment
<b>Discuss:</b>	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**

During the transport of an intubated, ventilated patient, the end-tidal carbon dioxide (ETCO<sub>2</sub>) trace on the transport monitor indicates that CO<sub>2</sub> is no longer detectable. List the possible causes and outline your response.

### **ANSWER TEMPLATE**

- Patient related possibilities
  - Airway issue – blockage or dislodgement of ETT
  - Patient disconnected from ventilator/ventilator tubing
  - Patient not ventilating – for example pneumothorax or high peak pressures resulting in transport ventilator ‘cutting out’ flow
  - CO<sub>2</sub> not being produced by the patient – cardiac arrest, massive pulmonary embolism
- Equipment related possibilities

- Capnography calibrating
  - Disconnection of ventilator/ventilator tubing (*no mark if already mentioned above*)
  - Transport monitor/cable failure
  - Capnography related problem – for example disconnection of ETCO<sub>2</sub> tubing or H<sub>2</sub>O within the tubing/capnography
- Response
    - Immediate patient assessment – check pulse, check ventilating
    - May need to modify transport to enable thorough assessment and treatment if needed – for example to gain access to the patient.
    - If patient issue:
      - CPR if arrest, or resuscitation as indicated
      - Change to bag mask ventilation
      - Check ETT position/blockage – reintubation if necessary
      - Treat if intrinsic lung pathology – thoracostomy for pneumothorax.
    - If confident patient is stable check equipment for disconnection or leak

Decision on continuation of transport to be made if equipment faulty; whether to continue or abort transfer will depend on factors including patient stability, reason for and urgency of transfer and estimated time remaining.

*Examiners Comments:*

*Overall done reasonably well. Few candidates considered transport related issues or gave a good systematic approach.*

Maximum Score	7.8
Percentage Passed	75.5%

**Question 2**

You are asked to review a 54-year-old female in the Emergency Department who has community acquired pneumonia. The chest X-ray shows multi-lobar consolidation.

Outline the factors that will influence your decision regarding admission to the Intensive Care Unit (ICU) for this patient.

**ANSWER TEMPLATE**

Intensive Care admission will be required for this patient if they need:

- interventions that cannot be provided elsewhere in the hospital (e.g. invasive mechanical ventilation, vasopressor support, etc), or
- require a high level of monitoring to allow early detection of deterioration and early intervention.

The factors that will influence the decision to admit this patient include

1. Patient factors
2. ICU factors
3. Hospital factors

## 1. The patient factors include:

### History

Presence of one or more of these features may alter the balance of risk and therefore the inclination to admit to ICU

- Background:
  - Comorbidities, baseline function
  - Previous or known respiratory disease
  - Malignancy
  - Smoking
  - Immune competence
- History of current illness
  - Rapid progression of symptoms
  - Contact and travel history
  - Response to therapy thus far

### Examination

- Overall clinical impression at the time of review
- Signs of respiratory distress
- Signs of other acute or chronic organ failure

### Investigations

- Routine venous blood
  - hyponatraemia, elevated creatinine, abnormal LFTs, DIC, anaemia...
- ABG
  - A-a gradient, acidaemia, CO<sub>2</sub>
- ECG
- CXR

### Severe Community acquired Pneumonia scoring systems

- There are several of these:
  - PSI
  - CURB-65
  - ATS criteria
  - SMART-COP
- None have sufficient sensitivity or specificity to be used alone

## 2. ICU Factors include

- Local admission policy and culture
- Bed and nursing staff availability
- Specific bedspace availability (if isolation required)

## 3. Hospital Factors

- Bed availability and capability (e.g. is there a respiratory high dependency unit?)
- Monitoring facilities on ward
- Oxygen delivery capability of ward (?HFNP)
- Medical, nursing staff and ancillary support staff (e.g., physiotherapy) capability of the ward

### Summary

The decision to admit the patient to the ICU will depend on the intersection between how sick the patient currently is, the best prediction of the likely clinical course over the next 24 hours, the capacity of the ICU to admit further patients and the capacity of the ward in that particular hospital to care for a moderately unwell patient with the potential to deteriorate and require further invasive interventions.

*Examiners Comments:*

*Overall answered well, with good answers considering patients background morbidities as well as local hospital and ICU factors.*

Maximum Score	7.5
Percentage Passed	63.3%

**Question 3**

- a) How are the World Federation of Neurosurgeons Score (WFNS) and the Fisher score calculated in the grading of aneurysmal subarachnoid haemorrhage (SAH)? (40% marks)
- b) What are the limitations of using these scores in the first 24 hours after the onset of SAH to determine prognosis? (60% marks)

**ANSWER TEMPLATE**

- WFNS (clinical grade)
  - I – GCS 15, no motor deficit
  - II – GCS 13-14, no motor deficit
  - III – GCS 13-14 and motor deficit
  - IV – GCS 7-12 +/- motor deficit
  - V – GCS 3-6 +/- motor deficit
- Fisher (radiological grade, based on brain CT)
  - I – no blood
  - II – diffuse deposition of SAH without clots or layers of blood < 1mm
  - III – localized clots and /or vertical layers of blood 1 mm or more in thickness
  - IV – diffuse or no subarachnoid blood but intracerebral or intraventricular clots

WFNS is a clinically graded score – gives information on prognosis

WFNS 3+ worse outcome

Fisher gives information on vasospasm risk

Fisher 3+ higher risk of vasospasm

Limitations of grading systems:

Neither have high sensitivity or specificity for outcomes

The scores may alter depending on when they are calculated – initial presentation, on arrival to ED or on arrival ICU

Sedation or paralysis can confound the interpretation

Effects of hydrocephalus or seizure – may suggest an initially unfavourable outcome,

Effects of rebleed may confound an initial positive grade

Expert assessment is required for radiological interpretation

WFNS uses GCS score which has poor inter-rater reliability

*Examiners Comments:*

*Many candidates failed to address the specific limitations of the scores and instead described general issues effecting prognosis in subarachnoid haemorrhage. Several failed to mention both scoring systems. Overall there was poor knowledge of the scoring systems.*

Maximum Score	7.8
Percentage Passed	34.7%

#### Question 4

- a) How would you diagnose Spontaneous Bacterial Peritonitis (SBP)? (30% marks)
- b) List four common organisms causing SBP. (20% marks)
- c) Other than SBP, list six common causes of decompensation of chronic liver disease. (30% marks)
- d) In a patient with suspected SBP, microscopy of ascitic fluid is reported as showing gram positive cocci, gram negative bacilli and fungal elements. What is the likely diagnosis? (20% marks)

#### ANSWER TEMPLATE

##### **a) How would you diagnose Spontaneous Bacterial Peritonitis (SBP)? (3 marks)**

Occurs in patients with cirrhosis and ascites

Signs and symptoms of fever, abdominal pain, abdominal tenderness, altered mental status, hypotension. May be relatively asymptomatic and requires high degree of suspicion.

Diagnosis confirmed by paracentesis:

Neutrophil count > 250 cells/mm<sup>3</sup>

Positive culture

Other tests that may be used in diagnosis include:

Albumin, Total protein, glucose, and LDH

Other causes of peritonitis should be excluded.

##### **b) List 4 common organisms causing SBP (2 marks)**

E. coli

Klebsiella

Strep pneumoniae

Enterococci

##### **c) Other than SBP List 6 common causes of decompensation of chronic liver disease (3 marks)**

Upper GI Bleeding

Alcohol consumption / alcoholic hepatitis

Dehydration / over diuresis

Protein load

Constipation

Portal vein thrombosis

HCC

##### **d) In a patient with suspected SBP microscopy of ascitic fluid is reported as showing gram positive cocci, gram negative bacilli and fungal elements. What is the likely diagnosis? (2 marks)**

Bowel perforation

*Examiners Comments:*

*Overall answered well – candidates should be careful to read the question and just give the number of answers that are required: extra answers do not gain marks.*

Maximum Score	7.8
Percentage Passed	71.4%

## Question 5

5.1

A 68-year-old female with type 2 diabetes mellitus and hypertension has been unwell for a week with a history of abdominal pain, vomiting and loss of appetite. She was brought to the Emergency Department where she is found to be hypothermic, hypotensive and delirious.

Her blood test results are shown below:

Parameter	Patient Value	Adult Normal Range
FiO <sub>2</sub>	0.6	
pH	7.07*	7.35 – 7.45
PO <sub>2</sub>	125 mmHg (16.67 kPa)	
PCO <sub>2</sub>	18.0 mmHg (2.53 kPa)*	35.0 – 45.0 (4.60 – 6.00)
SpO <sub>2</sub>	96%	
Bicarbonate	5.0 mmol/L*	22.0 – 26.0
Base Excess	-23.0 mmol/L*	-2.0 – +2.0
Lactate	11.5 mmol/L*	0.5 – 1.6
Sodium	141 mmol/L	135 – 145
Potassium	5.4 mmol/L*	3.5 – 5.0
Chloride	93 mmol/L*	95 – 105
Glucose	9.2 mmol/L*	3.5 – 6.0
Urea	29.0 mmol/L*	3.0 – 8.0
Creatinine	372 µmol/L*	45 – 90
Ionised calcium	1.26 mmol/L	1.10 – 1.35
Calcium corrected	2.41 mmol/L	2.12 – 2.62
Phosphate	3.17 mmol/L*	0.80 – 1.50
Creatinine Kinase	99 U/L	55 – 170
Haemoglobin	77 g/L*	120 – 160
White Cell Count	16.4 x 10 <sup>9</sup> /L*	4.0 – 11.0
Platelet count	296 x 10 <sup>9</sup> /L	150 – 350

- a) Describe the abnormalities in her blood test results and give a possible cause for each. (30% marks)
- b) List six other investigations you would order. (30% marks)

## ANSWER TEMPLATE

5.1

- a)
1. Severe HAGMA Anion gap 43 – sepsis, shock from any cause
  2. Lactic acidosis – ischaemic bowel, sepsis, metformin toxicity
  3. Delta ratio 1.6, pure high anion gap acidosis as per a.
  4. Hyperglycaemia, stress response, not high enough to be primary cause of metabolic abnormalities
  5. Renal impairment – sepsis, shock, impaired perfusion
  6. Hyperkalaemia and hyperphosphatemia likely secondary to renal impairment
  7. Anaemia – sepsis

8. Leucocytosis – sepsis, stress response
9. Elevated A-a Gradient @ 292mmHg – aspiration, pneumonia

(Any plausible answer acceptable.)

b)

1. Serum Ketones
2. Measured osmolality
3. Lipase
4. Septic screen
5. CXR
6. ECG and troponin
7. Transthoracic echocardiogram
8. CT abdomen (or USS)
9. Renal USS
10. LFT's

5.2

A 47-year-old, previously well, 70 kg male was admitted to the Emergency Department with agitation and confusion. Following catheterisation, his urine output in the next few hours was 300 – 350 ml/hr. The results of his blood tests are as follows:

Parameter	Patient Value	Adult Normal Range
Sodium	169 mmol/L*	135 – 145
Potassium	4.6 mmol/L	3.5 – 5.0
Chloride	105 mmol/L	95 – 105
Bicarbonate	26.0 mmol/L	22.0 – 26.0
Glucose	6.6 mmol/L*	3.5 – 6.0
Urea	9.6 mmol/L*	3.0 – 8.0
Creatinine	115 µmol/L*	45 – 90
Magnesium	0.88 mmol/L	0.75 – 0.95
Albumin	28 g/L*	35 – 50
Protein	58 g/L*	60 – 80
Plasma osmolality	360 mmol/kg*	290 – 310
Urine specific gravity	1.005*	1.010 – 1.030

- a) What is the most likely diagnosis? (10% marks)
- b) How would you manage the hypernatremia? (30% marks)

### ANSWER TEMPLATE

5.2

a)

Diabetes Insipidus

b)

- Examination to assess fluid status, Cardiac status
- Specific therapy -
  - 5%Dextrose or Sterile water administration with hourly Sodium Measurement- calculate water deficit and correct over time frame

- Stop offending medications. If history of Lithium Intake-Lithium Levels
- Desmopressin or vasopressin
- Thiazides/Amiloride/Acetazolamide (if lithium)
- Avoid rapid correction

*Examiner Comments:*

*Examiners noted a lack of detail in some answers with anion gap or Aa gradient not mentioned. Management of diabetes insipidus was handled poorly, as some of the described fluid regimes were considered dangerous*

Maximum Score	7.8
Percentage Passed	71.4%

## Question 6

With respect to neurological recovery after out of hospital cardiac arrest, discuss the factors which may confound prognostication and how they can be minimised.

### ANSWER TEMPLATE

#### General

Testing too early (esp. before 72 hrs) is unreliable  
 Hypothermia and sedative/ relaxants confound most tests  
 Associated organ impairments (renal, hepatic) may delay sedative drug clearance and cause encephalopathy  
 Seizures (convulsive or non-convulsive)  
 Many studies done were not blinded – risk of self-fulfilling prophesy

#### Clinical:

Pupil responses may be underestimated cf. pupilometer  
 Pre-existing ocular pathology – e.g. cataracts, blindness  
 Recent use of high dose adrenaline, eye drops  
 Corneal reflex- Less specific than pupil response  
 Motor responses before 72 hrs unreliable  
 Status myoclonus is poorly defined  
 Lance-Adams syndrome of awake myoclonus not predictive  
 Pre-existing weakness or other pathologies

#### Electrophysiological:

Background signal noise may cause false positives.  
 Lack of standardisation in measurement  
 Electrode placement may be inconsistent  
 Poorly defined endpoints

#### Radiology

Brain imaging studies are substantially effected by timing of the study as changes evolve over time.  
 All imaging studies limited by small sample size and selection bias.

#### Biomarkers:

Threshold values for and timing not well established  
 Measurement and other tissue confounders not well established e.g. in haemolysis.  
 Poorly defined endpoints

## Minimising the confounders

Define the context/ exclude other causes of unconsciousness

Caution with renal or hepatic impairment

Knowledge of any pre-existing pathologies from history

Waiting at least 72 hrs longer before testing if hypothermia/ sedation/ relaxant

Multiple modality testing is more reliable than single tests

Repeated observation especially when patient is hypothermic/ recent sedation or there is doubt

Most unconscious patients will recover within 5 days and nearly all by 8 days.

Skill in interpretation is required for most test especially electrophysiology and imaging

Use of TOF to exclude paralysis

Be aware of the risk of self-fulfilling prophesy.

*Examiners Comments:*

*Overall poorly answered with limited detail and little attention paid to the factors which confound prognostication.*

Maximum Score	7.5
Percentage Passed	32.7%

## Question 7

- What are the radiological features of colonic pseudo-obstruction / Ogilvie's syndrome? (20% marks)
- List six conditions which are associated with colonic pseudo obstruction. (20% marks)
- Briefly outline your approach to management. (60% marks)

## ANSWER TEMPLATE

a)

Plain films: - Identical to mechanical obstruction: dilated bowel loops: may have fluid levels  
CT demonstrates dilated large bowel without a clear transition point or obstructing lesion.

b)

Trauma, especially fractures

Recent surgery, especially involving spinal anaesthesia

Burns

Diabetes Mellitus

Uraemia

Severe medical illness, such as pneumonia, myocardial infarction, or heart failure

Neurologic conditions

Chemotherapy (e.g., all-trans retinoic acid, methotrexate, vincristine)

Retroperitoneal pathology, such as malignancy or haemorrhage

Electrolyte disturbance

Medication (e.g., narcotics, phenothiazine's, calcium channel blockers, alpha-2-adrenergic agonists, epidural analgesics)

c)

Initial management of acute colonic pseudo-obstruction consists of conservative therapy in patients without significant abdominal pain or signs of peritonitis and those who have one or more potential factors that are reversible.

Treat underlying disease, stop aggravating drugs, avoid laxatives, and keep NPO. NG tube – encourage mobility. Consider opiate reversal agents e.g. GI naloxone or SC Naltrexone

If fail or progress consider neostigmine: In patients with caecal diameter >12 cm (varies) or failure of 24 to 48 hours of conservative therapy. Up to 2 mg slow IV and repeat if needed. Lower doses may also be effective. Studies have shown high response rate with low rate of recurrence. Side effects include abdominal pain, hypersalivation, vomiting and bradycardia. Perforation may occur if there is unrecognised mechanical obstruction.

Colonoscopy decompression: Those patients who fail or who have contraindications to neostigmine. Technically difficult and perforation is a risk. No randomised trials.

Surgery: In the absence of a colonic perforation, cecostomy tube or a segmental or subtotal resection with primary anastomosis can be performed. In the patients with a colonic perforation, a total colectomy, ileostomy, and Hartmann procedure are performed to retain the option of future ileorectal anastomosis

*Examiners Comments:*

*Management plan poorly structured in many cases. Overall reasonably well answered.*

Maximum Score	7.3
Percentage Passed	59.2%

## Question 8

Critically evaluate the role of ventilatory recruitment maneuvers in the critically ill.

### ANSWER TEMPLATE

#### Answer

Introductory statement

Recruitment maneuvers are ventilator manipulations to improve oxygenation in moderate to severe ARDS. Often used as part of an open lung strategy.

#### Rationale

In ARDS, collapsed/consolidated alveoli are unable to take part in gas exchange. In addition, the recurrent opening and closing of units can contribute to atelectrauma.

Recruitment maneuver is a temporary increase in pulmonary pressures to open collapsed alveoli. Subsequent PEEP titration aims to prevent cyclical opening/closing of these units.

#### Advantages

May lead to improved oxygenation, compliance and markers of inflammation (decreased).

Cheap, Simple, quick c.f. ECMO, iNO

#### Disadvantages

Need for sedation/paralysis

Transient oxygenation response

Risk barotrauma

VILI  
Worsening of shunt  
Cardiovascular instability  
No consensus on how they should be performed.

### Evidence

Studies in mod – severe ARDS, including a Meta-analysis have failed to demonstrate patient-centred outcome benefit. Trials generally of poor quality, high risk of bias.

Latest trial ART: showed increased 6/12 mortality, barotrauma and length of mechanical ventilation in group undergoing RMs cf no RMs (and there were 3 cardiac arrests during RMs). Considered a large well designed trial, potential weaknesses include inability to blind and the use of stepwise PEEP recruitment.

PHARLAP – another large trial examining this issue has now ceased recruitment in the light of the ART results.

### Own practice

Anything reasonable here including “I do not perform recruitment maneuvers”

*If a candidate was unaware of the ART trial and described a routine use of Recruitment Maneuvers they were should be marked down at the examiners discretion.*

### Examiners Comments:

*This question was overall answered well by many candidates. A logical explanation of the rationale for recruitment and its benefits as well as possible harm along with a mention of recent literature was required to score marks. Good candidates understood that although oxygenation may improve with recruitment maneuvers mortality benefit was not demonstrated in any trials. The risk of possible harm from the ART study as well PHARLAP ceasing recruitment due to this was noted by some candidates.*

Maximum Score	7.2
Percentage Passed	69.4%

### Question 9

You have been called to the Emergency Department to review a previously well adult male who has sustained a penetrating injury to the root of the neck.

- Describe the anatomy of the root of the neck on the left side describing the clinically important structures that may be injured. (50% marks)
- Outline the issues specific to management of a penetrating neck injury. (50% marks)

### ANSWER TEMPLATE

a)  
The root of the neck is the junction between the thorax and the neck. It opens into, and is the cervical side of, the superior thoracic aperture, through which pass all structures going from the head to the thorax and vice versa

The root of the neck is bound laterally by the first rib, anteriorly by the manubrium, and posteriorly by the T1 vertebrae.

From anterior to posterior, the major contents are:  
Subclavian artery and branches

- vertebral artery
- internal thoracic artery
- thyrocervical trunk
- costocervical trunk

Subclavian vein and tributaries (EJV)

Trachea

Oesophagus

Vagus nerve

Recurrent Laryngeal nerve

Dome of pleura

Brachial plexus

Lymphatics and thoracic duct

Phrenic nerve

Sympathetic chain, stellate ganglion

Scalene muscle.

Clavicle

b)

Requires management at a trauma centre with appropriate expertise. May require multiple speciality input - interventional radiology, ENT, vascular, cardiothoracic.

Airway issues:

The possibility of laryngeal/ tracheal injury and the risk of intubating the “false airway passage”. Consider tracheostomy under local anaesthesia.

Urgent surgical exploration required for haemodynamic compromise, expanding or pulsatile haematoma, extensive subcutaneous emphysema, stridor, or neurological deficit with intra op bronchoscopy/ endoscopy/ angiography if available.

If no indication for urgent surgical exploration requires CT angiography (or equivalent) with close observation in ICU +/- flexible laryngoscopy +/- endoscopy +/- oral contrast swallow study.

*Examiners Comments:*

*Generally, poorly answered. Limited knowledge of anatomy and poor structure to answers. A broad approach with a logical approach to prioritisation of investigations/treatments was all that was required to score well. Few candidates commented on general principles of complex trauma requiring input from multiple teams.*

Maximum Score	7.7
Percentage Passed	26.5%

## Question 10

With regard to gastric ulceration in the ICU:

- a) List five risk factors for developing stress related gastric ulceration in ICU patients. (20% marks)
- b) Discuss briefly strategies for prevention of gastrointestinal bleeding resulting from stress ulcers among ICU patients. Include in your answer the available evidence for these. (80% marks)

## ANSWER TEMPLATE

a)

### Risk factors

1. Coagulopathy,
2. Mechanical ventilation for >48 hours
3. Renal failure
4. Traumatic brain injury, spinal cord injury, or burn injury
5. History of GI ulceration or bleeding within the past year
6. Shock
7. An intensive care unit (ICU) stay more than one week,
8. Occult GI bleeding for six or more days
9. Glucocorticoid therapy.

b)

### Strategies for prevention of GI bleeding resulting from stress ulcers among ICU patients.

1. Prevent gastric ischemia
  - Treat underlying problem responsible for gut Ischemia.
  - Supportive ICU care
2. Reduce gastric acid injury
  - Decrease acid production (H<sub>2</sub> Antagonist and PPI)
    - Advantages
      1. Decreased risk of gastrointestinal bleeding
      2. Decreased exposure to blood products, and associated risk related to transfusion
    - Disadvantages
      1. Decreased gastric acidity, thus increased risk of non-sterile aspiration and development of nosocomial pneumonia.
      2. Increased risk of gastrointestinal bacterial overgrowth and translocation
      3. Increased risk of Clostridium difficile infections

### H2 blockers:

Inhibits histamine stimulated acid secretion and are better than placebo, antacid or sucralfate as stress ulcer prophylaxis. No evidence they are superior than PPI.

Tolerance, requires dose adjustment in renal failure; rarely causes thrombocytopenia.

### Proton pump inhibitors:

Pantoprazole and omeprazole do seem to have some benefit in protecting patients from stress ulceration. In critically ill patients, proton pump inhibitors seem to be more effective than histamine 2 receptor antagonists in preventing clinically important and overt upper gastrointestinal bleeding. No clear evidence that one PPI is better than the other.

Meta-analysis of 13 RCTs; n = 1587 patients (H2 blockers versus PPI) Found less GI bleeding among those who received a PPI (1.3 versus 6.6 percent, odds ratio 0.30, 95% CI 0.17-0.54) no difference in mortality or the incidence of nosocomial pneumonia. (*Detail not required*)

Side effects include: Interstitial nephritis Clostridium *difficile* enterocolitis, GI upset and headaches. Long-term use associated with fractures, hypomagnesemia hypocalcemia.

### Enteral feeding

Observational studies data suggest that enteral nutrition may be adequate substitute for pharmacologic stress ulcer prophylaxis in ICU patients, however controlled trials are necessary for confirmation. There appears to be no benefit for stress ulcer prophylaxis in patients who are tolerating enteral feeding, and in these patients stress ulcer prophylaxis may not be needed. However, it is still unclear if enteral feeding is alone sufficient in protection of stress ulcers in high risk patients.

## Examiners Comments:

Generally, poorly answered. Superficial knowledge of pharmacology and evidence base.

Maximum Score	6.3
Percentage Passed	14.3%

## Question 11

Discuss the pathophysiology, clinical features and the management of a patient who presents with acute crystal methamphetamine (“ICE”) intoxication.

### ANSWER TEMPLATE

#### Pathophysiology

- Methamphetamine lacks direct adrenergic effects, but is instead an indirect neurotransmitter by displacing adrenaline, noradrenaline, dopamine, and serotonin into the cytosol, leading to a surge of adrenergic stimulation.
- Serotonergic activation contributes to alterations in mood as well as deranged responses to hunger and thirst.

#### Clinical features

- Systemic / vital signs
  - Hypertension
  - Tachycardia
  - Tachypnea
  - Hyperthermia
- CNS
  - Severely agitated delirium / psychosis
  - Seizures
  - Coma
- CVS
  - Stress-induced cardiomyopathy
  - Accelerated Atherosclerosis
- Metabolic
  - Metabolic acidosis
  - Hyperkalemia/Hypernatraemia
  - Other electrolyte disturbances
- Oliguric renal failure
- Skin – track marks, cellulitis, abscess

Candidates should have demonstrated an understanding of the multisystem nature of the condition (e.g. listing of several affected systems) in order to score well for this section.

#### Management

- Mainly supportive management
  - Management of severe agitation with high risk of self-harm or harm to others – pharmacological and non-pharmacological management
    - Sedation with benzodiazepines/consider dexmetomidine or clonidine
    - Low threshold to intubate
      - ◆ Avoid succinylcholine
  - Aggressive cooling for hyperthermia with combination of techniques – surface cooling, intravenous cooling, antipyretics
  - Control of autonomic disturbance (tachycardia, hypertension)

- Autonomic disturbance (tachycardia, hypertension) – combined alpha + beta blocker (avoid pure beta blockade due to risk of malignant hypertension)

*Examiners Comments:*

*A number of candidates only mentioned generic details in their answer instead of specific issues related to the condition. Knowledge of the pathophysiology was poor.*

Maximum Score	9.5
Percentage Passed	57.1%

## Question 12

*(Image removed from report.)*

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

12.1

The following results were obtained from a 23-year-old female admitted with severe asthma.

Parameter	Patient Value	Adult Normal Range
FiO <sub>2</sub>	0.4	
pH	6.92*	7.35 – 7.45
PO <sub>2</sub>	81 mmHg (10.8 kPa)	
PCO <sub>2</sub>	71.0 mmHg (9.5 kPa)*	35.0 – 45.0 (4.6 – 6.0)
SpO <sub>2</sub>	95%	
Bicarbonate	14.0 mmol/L*	22.0 – 26.0
Base Excess	-16.0 mmol/L*	-2.0 – +2.0
Lactate	9.0 mmol/L*	0.5 – 1.6
Sodium	139 mmol/L	135 – 145
Potassium	4.2 mmol/L	3.5 – 5.0
Chloride	108 mmol/L*	95 – 105
Glucose	19.2 mmol/L*	3.5 – 6.0

- a) Describe the abnormalities and give a potential reason for each. (30% marks)

## ANSWER TEMPLATE

12.1

- a)  
 Primary respiratory acidosis – likely secondary to asthma,  
 Secondary high anion gap metabolic acidosis – shock, sepsis  
 Concomitant non-anion gap metabolic acidosis – fluid resuscitation, (delta ratio 0.5)  
 Increased Aa gradient – pulmonary sepsis  
 Elevated lactate – sepsis, B2 agonist use  
 Elevated glucose – pre-existing diabetes, stress, B2 agonist, steroids

## 12.2

You are asked to see a 73-year-old female on the ward. She was admitted to the Emergency Department in a dishevelled state.

She has the following vital signs and investigation results:

Temperature: 34.5°C  
 Blood pressure: 80/40 mmHg  
 Glasgow Coma Score: 11

Parameter	Patient Value	Adult Normal Range
FiO <sub>2</sub>	0.28	
pH	7.26*	7.35 – 7.45
PO <sub>2</sub>	62 mmHg (8.3 kPa)	
PCO <sub>2</sub>	37.0 mmHg (4.7 kPa)	35.0 – 45.0 (4.6 – 6.0)
SpO <sub>2</sub>	92%	
Bicarbonate	16.0 mmol/L*	22.0 – 26.0
Base Excess	-10.0 mmol/L*	-2.0 – +2.0
Lactate	3.1 mmol/L*	0.5 – 1.6
Sodium	128 mmol/L*	135 – 145
Potassium	3.1 mmol/L*	3.5 – 5.0
Chloride	90 mmol/L*	95 – 105
Glucose	3.2 mmol/L*	3.5 – 6.0
Urea	13.0 mmol/L*	3.0 – 8.0
Creatinine	132 µmol/L*	45 – 90
Creatinine Kinase	1500 U/L*	55 – 170
Haemoglobin	80 g/L*	120 – 160
White Cell Count	15.0 x 10 <sup>9</sup> /L*	4.0 – 11.0
Platelet count	250 x 10 <sup>9</sup> /L	150 – 350

- a) Comment on the acid base status and ECG abnormalities (ECG 12.2 shown on page 11). (30% marks)
- b) List the two most likely differential diagnosis. (20% marks)

### ANSWER TEMPLATE

## 12.2

a)  
 Primary metabolic acidosis  
 Associated respiratory acidosis, or inadequate compensation  
 Increased anion gap. (22)  
 Delta ratio 1.2 – pure high anion gap acidosis

ECG: low voltage  
 Relative bradycardia  
 Prolonged QT

b)  
 Myxoedema coma.  
 Sepsis

12.3

- a) Describe the acid base abnormalities in the following results and suggest a possible cause. (20% marks)

Parameter	Patient Value	Adult Normal Range
FiO <sub>2</sub>	0.5	
pH	7.37	7.35 – 7.45
PO <sub>2</sub>	90 mmHg (12 kPa)	
PCO <sub>2</sub>	25.0 mmHg (3.6 kPa)*	35.0 – 45.0 (4.6 – 6.0)
SpO <sub>2</sub>	93%	
Bicarbonate	14.0 mmol/L*	22.0 – 26.0
Base Excess	-10.0 mmol/L*	-2.0 – +2.0
Lactate	1.2 mmol/L	0.5 – 1.6
Sodium	145 mmol/L	135 – 145
Potassium	4.2 mmol/L	3.5 – 5.0
Chloride	93 mmol/L*	95 – 105
Glucose	5.0 mmol/L	3.5 – 6.0

### ANSWER TEMPLATE

12.3

- a)  
Metabolic acidosis  
Concomitant respiratory alkalosis  
Elevated anion gap  
Delta ratio 2.6 – concomitant metabolic alkalosis

Salicylate toxicity  
Sepsis with vomiting/pain  
Any other plausible.

Maximum Score	8.5
Percentage Passed	79.6%

### Question 13

Compare and contrast Serotonin Syndrome with Neuroleptic Malignant Syndrome.

#### ANSWER TEMPLATE

	<b>Serotonin syndrome (SS)</b>	<b>Neuroleptic malignant syndrome (NMS)</b>
<b>Precipitants &amp; Risk factors</b>	<p>Serotonergic Agents such as TCAs, SSRIs, SNRIs, MAOIs, triptans, nefazodone, buspirone, mirtazapine, carbamazepine, tramadol, linezolid, MDMA (ecstasy), dextromethorphan, St. John's wort, lithium, methadone, cocaine, levodopa, reserpine, and amphetamines. <i>*naming a few drugs/classes adequate</i></p> <p>Usually concurrent use of multiple agents</p> <p>Concurrent use of serotonergic agents</p> <p>Use of illicit drugs, especially when used in patients concurrently taking a serotonin enhancing drug.</p>	<p>Dopamine Antagonists such as antipsychotics and antiemetics. Also, abrupt withdrawal of dopamine agonists, for instance, those used in the management of Parkinson's disease, may produce signs and symptoms correlating with NMS. NMS does not necessarily correspond with high doses of antipsychotics, as it can occur with lower doses</p> <p>Use of first- &amp;/or second-generation antipsychotics. Use of higher doses of first- &amp;/or second-generation antipsychotics</p> <p>Rapid escalation of dosing, switching among agents, higher potency agents, and long-acting depot formulations</p>
<b>Incidence</b>	Rare	0.02–2.4% in patients being treated with neuroleptics
<b>Time of onset following inciting agent</b>	<b>Usually &lt; 24 hours</b> of initiation or change in a medication	<b>Usually 1-3 days (can be later)</b> of exposure to a dopamine antagonist or withdrawal of a dopamine agonist
<b>Autonomic features</b>	<p>Tachypnoea</p> <p>Hyperthermia (&gt; 40°C)</p> <p>Tachycardia</p> <p>Hypertension</p> <p>Diaphoresis</p> <p>Hypersalivation</p>	<p>Tachypnoea</p> <p>Hyperthermia (&gt; 40°C)</p> <p>Tachycardia</p> <p>Hypertension</p> <p>Diaphoresis</p> <p>Hypersalivation</p>
<b>Neuromuscular</b>	<p>Increased tone, worse in the lower extremities than upper extremities</p> <p>Hyperreflexia</p> <p>Clonus (unless masked by increased muscle tone)</p> <p>Dilated pupils</p> <p>Classically agitation then coma</p>	<p>'Lead-pipe' rigidity globally</p> <p>Rapid, increasing signs of extrapyramidal symptoms</p> <p>Hyporeflexia</p> <p>Normal pupils</p> <p>Classically alert then coma</p>
<b>Treatment</b>	<p>Discontinue serotonergic agents</p> <p>Benzodiazepines</p> <p>Cyproheptadine</p> <p>Supportive management</p>	<p>Discontinue dopaminergic agents</p> <p>Cooling</p> <p>Fluids</p> <p>Benzodiazepines</p> <p>Dopamine agonists e.g. Bromocriptine or amantidine</p> <p>Dantrolene</p> <p>Supportive management</p>

### Examiners Comments:

Marks were allocated to descriptions of Precipitants and Risk factors, Clinical Features/Diagnosis and Management – the specific headings in the Table were not required.

Many candidates lacked the basic knowledge to pass the question, and many did not complete it. Many confused Neuroleptic Malignant Syndrome with Malignant Hyperthermia.

Maximum Score	7.2
Percentage Passed	16.3%

### Question 14

A two-week-old baby is brought to your general ICU in extremis pending transfer to a Paediatric centre. Born at term, she had been discharged well on day 5 of life. For three days she has had progressive tachypnoea, lethargy and failure to feed, and has now presented after a seizure. She has been intubated in the Emergency Department.

Blood test results taken on air prior to intubation are shown below:

Parameter	Patient Value	Adult Normal Range
pH	7.04*	7.35 – 7.45
PCO <sub>2</sub>	14 mmHg (1.9 kPa)*	35 – 45 (4.6 – 6.0)
PO <sub>2</sub>	80 mmHg (10.5 kPa)	
Bicarbonate	5 mmol/L*	22 – 28
Lactate	8 mmol/L*	< 2
Glucose	0.9 mmol/L*	3.5 – 6.1
White Cell Count	14.7 x 10 <sup>9</sup> /L*	4.0 – 11.0
Neutrophils	27%	
Lymphocytes	70%	
Alanine aminotransferase (ALT)	1600 U/L*	10 – 55
Aspartate aminotransferase (AST)	2200 U/L*	10 – 40

- List, in broad terms, the key differential diagnoses for this presentation. (20% marks)
- Outline your approach to differentiating between these diagnoses. (30% marks)
- Outline principles of early management pending transfer. (50% marks)

### ANSWER TEMPLATE

- Inborn error of metabolism<sup>[1][2]</sup>  
Sepsis (viral likely)<sup>[1][2]</sup>  
Cardiac disease- especially duct dependent disease  
Trauma (NAI)<sup>[1][2]</sup>  
Drugs / Toxins
- History:*  
Exposure to ill persons including siblings and parents.  
“Colds”, chicken pox and maternal herpes should be specifically solicited.<sup>[1][2]</sup>

Maternal Group B Strep swab should be reviewed

Injury

Cyanotic spells

Apnoeas

Family history including infant deaths, inborn errors of metabolism (IEMs), cardiac disease, degree of consanguinity

*Examination:*

General exam - trauma, rash Liver edge (failure, hepatitis) Murmurs Femoral pulses

*Investigations:*

CXR

ECC

Ammonia

Urine amino and organic acids (if can't be processed, take while acidotic and store)

Cultures if not done

CMV, HSV PCR

Consider skeletal survey if any suggestion of injury

Cranial ultrasound (widely available)

Echo if available

c) Ongoing liaison with receiving centre.

Restore then maintain BSL using 10% Glucose (2.5-5ml/kg 10% glucose bolus then 6mg/kg/min infusion.)

Restore intravascular volume (even post FEAST fluid bolus reasonable)

Direct therapy if specific pathology found- e.g. alprostadil infusion if evidence of duct dependent cardiac disease

Empiric antibiotics

Empiric antiviral given results above (acyclovir or ganciclovir)

Nil protein intake till initial metabolic results in- maintain on glucose as above

Lung protective ventilation

General ICU housekeeping.

*Examiners Comments:*

*Reasonably well done. Part a) was answered better than b) and c). Some candidates did not read the question completely and described intubation of the baby.*

Maximum Score	7.9
Percentage Passed	57.1%

**Question 15**

*(Images removed from report.)*

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

15.1

At an emergency call a patient has a sudden loss of consciousness and her ECG is as seen on page 14 (ECG 15.1).

a) What is your diagnosis?

(10% marks)

- b) What risk factors could precipitate this arrhythmia? (10% marks)
- c) How will you manage the patient? (30% marks)

### ANSWER TEMPLATE

15.1

a)  
Torsade de pointes/ VT triggered by a R on T phenomenon

b)  
Congenital Long QT syndromes  
Acquired long QT  
Drugs  
Hypokalemia, hypomagnesemia  
MI, Takotsubo cardiomyopathy  
SAH  
Female gender  
Bradycardia

c)  
Assess ABC, ALS algorithm, unsynchronized defibrillation. Magnesium. Prevent recurrence by pacing or isoprenaline to increase the heart rate to a level that prevents further torsade.

15.2

A 45-year-old male post-cholecystectomy for acute gangrenous cholecystitis complains of palpitations.

His ECG is shown on page 15 (ECG 15.2).

- a) Interpret this ECG. (10% marks)
- b) Outline your management principles. (40% marks)

### ANSWER TEMPLATE

15.2

a)  
This ECG shows a broad complex, regular tachycardia at a rate of 230 with no apparent P waves. This could be either a VT or SVT with aberrant conduction.

b)  
Check effect of this tachycardia on the patient's haemodynamics: BP, perfusion, SpO2  
If haemodynamics compromised treat urgently with synchronized cardioversion following ALS principles and guidelines.

If haemodynamics not compromised:  
Check a previous ECG for evidence of a conduction defect  
Correct electrolyte abnormalities  
Move patient to a monitored environment (CCU/ICU)

Slow rate down with adenosine. If this is a SVT with aberrancy we might see underlying rhythm/conduction abnormality. VT will not slow down with adenosine.

Anti-arrhythmic therapy: Amiodarone if unsure re VT?SVT

Maximum Score	9.0
Percentage Passed	51.0%

## Question 16

Outline the specific management issues to address in a patient during the first 24 hours following liver transplantation.

### ANSWER TEMPLATE

Initial detailed assessment and resuscitation as indicated

Particular care regarding volume status and identification of bleeding and early graft function

Adequate analgesia and sedation

Protocolised care; close liaison between ICU and other teams involved e.g. surgeons and transplant physicians

Enteral nutrition

DVT prophylaxis; usually mechanical

Early mobilisation

Lines and access management: need to rationalise multiple access when stability achieved and coagulation profile acceptable

Assess suitability for stepdown if no complications

### Cardiovascular

Vasodilated state often requiring pressor support for adequate MAP

Careful management of volume status and early recognition of bleeding important; large fluid shifts; drain losses may be large and require ongoing volume administration.

Avoid elevated CVP

### Graft

Assessment of function via monitoring of coagulation profile, lactate, acid base and transaminases. (frequent blood tests/QID)

Ultrasound assessment of graft particularly hepatic artery / vein / portal vein patency and flow characteristics

Primary graft nonfunction may be indicated by conventional signs of liver failure i.e. worsening coagulopathy, acidosis, encephalopathy, AKI, hypoglycaemia

### Respiratory

Early extubation when stability ensured

Patients with hepatopulmonary syndrome or portopulmonary hypertension may need prolongation of ventilation. pHT may require perioperative management with chronic therapies as well as acute therapies to reduce congestion of graft

### Coagulation / Transfusion

Coagulopathy monitored and indicator of graft function, viscoelastic tests

Not corrected unless bleeding or severe coagulopathy due to risks vascular thrombosis

Hb target above 70 but consideration venesection if Hb > 100g/l

### Immunosuppression

Should be protocolled e.g. Methylprednisolone / Azathioprine OR MMF / Tacrolimus OR Cyclosporin

Variations may be institution based or patient factors e.g. Basiliximab may be given if renal dysfunction preoperatively in lieu of Calcineurin inhibitor

### **Infection**

Routine postoperative antibiotics not necessary but will depend upon institutional protocols / intraoperative events and preoperative patient status

Postoperative IV antifungals often given in high risk cases (higher CP or MELD status)

CMV prophylaxis if CMV pos graft in CMV neg recipient

Hep B Ig and ongoing antivirals if Hep B patients

Cytotoxic precautions

### **Renal**

Oliguria likely indicator of hypovolaemia; assess for bleeding

Consider intraabdominal hypertension

### *Examiner Comments:*

*Generally, well answered. Candidates that did poorly made generic comments about post-operative care without specific issues related to liver transplantation or lacked detail in their answers.*

Maximum Score	7.3
Percentage Passed	75.5%

### **Question 17**

List the potential causes of polyuria during the immediate post-operative period in a patient who has undergone surgery for a pituitary tumour.

For each cause listed, outline the following:

- i. Mechanism of action,
- ii. Approach to diagnosis, and
- iii. Management

### **ANSWER TEMPLATE**

#### **Central Diabetes Insipidus-**

##### *Mechanism of action-*

Anatomic injury to hypothalamus, pituitary stalk or posterior pituitary gland. Usually partial or total disruption of pituitary stalk-severs connections between cell bodies of ADH secreting neurons in hypothalamus and their nerve endings in posterior pituitary preventing ADH secretion.

ADH acts at the V2 receptor via cAMP and is responsible for the insertion and removal of water (aquaporin) channels into luminal membrane of renal tubules thereby altering permeability to water.

##### *Approach to diagnosis-*

Hypotonic polyuria- Urine output >300ml/hr x 3hrs OR >2.5ml/kg/hr OR >3L/day. Urine osmolality<200mOsm/kg (urine specific gravity <1.010), Hypernatraemia. Lab parameters may be affected if patient has access to free water.

##### *Management-*

DDAVP (Desmopressin) 1-4mcg SC or IM (OR short acting AVP analogue), monitor urine output, watch for hyponatraemia developing. Allow to drink to thirst if possible and monitor. Exclude other causes of polyuria (as below). Monitor urine and serum osmolality and electrolytes.

### **Hyperglycaemia-**

#### *Mechanism of action-*

Osmotic diuresis from high blood glucose levels.

#### *Approach to diagnosis-*

Presence of high blood glucose levels in the context of glucocorticoid administration following pituitary tumour resection or from Cushing's disease or GH-secreting tumour.

#### *Management-*

Correct BGLs with insulin. Correct volume deficit and monitor fluid balance, electrolytes.

### **High volume IV fluid administration-**

#### *Mechanism of action-*

High volume IV fluid administration intra-operatively

#### *Approach to diagnosis-*

Evidence of high volume IV fluids, electrolytes measured may vary with fluid administered

#### *Management-*

Should be self-limiting. Monitor urine output/electrolytes.

### **Acute fall in Growth Hormone-**

#### *Mechanism of action-*

Drop of blood levels of GH and IGF-1 that cause fluid retention when inappropriately high due to a GH-secreting tumour.

#### *Approach to diagnosis-*

Context of GH secreting tumour and acromegaly. Serum and urine electrolytes and osmolalities should be in reference range.

#### *Management-*

Should be self-limiting. Monitor urine output/electrolytes.

### **Mannitol administration-**

#### *Mechanism of action-*

Osmotic diuresis

#### *Approach to diagnosis-*

Administration of mannitol due to large tumour/cerebral oedema (unusual). Osmolar gap may be seen.

#### *Management-*

Should be self-limiting. Monitor urine output/electrolytes

#### *Examiner Comments:*

*Maximum score if Diabetes Insipidus not mentioned was 4 marks. Must have mentioned at least two causes to achieve passing mark.*

Maximum Score	7.5
Percentage Passed	59.2%

### **Question 18**

“All patients with return of spontaneous circulation after out of hospital cardiac arrest should have an urgent cardiac catheterisation, including patients with normal post resuscitation ECGs.”

What are the pros and cons of this approach?

## ANSWER TEMPLATE

### Pros

- a. In the presence of ST elevation post OHCA (Out of Hospital Cardiac Arrest) all patients without absolute contra-indications should go to cath lab
- b. Patients without clear symptoms or signs of ischaemia may still have had an ischaemic cause for arrest. Case series and registries of OHCA have suggested that 1/4 cases taken to cab lab with no ECG evidence of ischemia will have lesions requiring treatment. Treatment in these patients will lead to a 60% survival improvement with a 90% chance of good neurological recovery. Most studies have published a number needed to treat of 4 to prevent one death with a 90% chance of good neurological recovery.
- c. Current recommendations from the American Heart Association suggest that any OHCA with ROSC should go to cath lab if ischemia is suspected
- d. Transfer to cath lab with treatment may prevent further cardiac arrests
- e. Professional (American Heart Association and European Resuscitation council) bodies who have made recommendations say there is no role in waiting to assess neurological recovery

### Cons

- a. These may be unstable patients
- b. The cath lab maybe isolated from other emergency services and take staff away from ED or ICU
- c. Transfer to another centre may be required
- d. Experienced staff are required to anaesthetize a patient undergoing coronary angioplasty or stenting.
- e. Taking all comers to cath lab may lead to many poor outcomes due to high pre OHCA morbidities.
- f. Many patients may be taken after prolonged cardiac arrest who may go onto survive with poor neurological recovery
- g. There are financial consequences to running a 24-hour cath lab service
- h. If there is another explanation for the cardiac arrest the time in the catheter lab maybe detrimental to the patient
- i. Anti-coagulation and anti-platelet medications may increase the risk of haemorrhage
- j. Difficulty with targeted temperature management in cath lab environment

### *Examiner Comments:*

*Overall reasonable answers. Not a great deal of reference to guidelines, and the “pro” side was not as well answered as the “con”.*

Maximum Score	7.0
Percentage Passed	55.1%

## Question 19

(Image removed from report.)

19.1

A 72-year-old male is admitted to the Intensive Care Unit (ICU) with anuric renal failure and haemofiltration is commenced. On the morning ward round, the haemofiltration effluent bag is noted to have a reddish colour (Figure 19.1 shown below).

His blood test results are given below:

Parameter	Patient Value	Adult Normal Range
Haemoglobin	76 g/L*	130 – 175
White Cell Count	$8.6 \times 10^9/L$	4.0 – 11.0
Platelets	$188 \times 10^9/L$	150 – 450
Neutrophils	$6.0 \times 10^9/L$	1.8 – 7.5
Lymphocytes	$1.80 \times 10^9/L$	1.50 – 4.00
Monocytes	$0.7 \times 10^9/L$	0.2 – 0.8
Eosinophils	$0.0 \times 10^9/L$	0.0 – 0.4
Haptoglobin	< 0.01 g/L*	0.25 – 1.80
Retics	3.7%*	0.5 – 2.0
Sodium	133 mmol/L*	135 – 145
Potassium	4.1 mmol/L	3.5 – 5.0
Chloride	95 mmol/L	95 – 105
Bicarbonate	28.0 mmol/L*	22.0 – 26.0
Creatinine	77 $\mu$ mol/L	45 – 90
Urea	7.1 mmol/L	3.0 – 8.0
Glucose	6.2 mmol/L*	3.5 – 6.0
Calcium corrected	1.89 mmol/L*	2.12 – 2.62
Phosphate	2.44 mmol/L*	0.80 – 1.50
Creatinine Kinase	65 U/L	55 – 170
Lactate dehydrogenase	1224 IU/L*	210 – 420

- a) What is the underlying process? (10% marks)
- b) Give four potential causes for this process. (40% marks)

## ANSWER TEMPLATE

19.1

- a)  
Iv haemolysis
- b)  
Incompatible transfusion  
Medications  
DIC/ sepsis  
Massive transfusion  
Pre-existing hereditary conditions e.g. G6PD deficiency, spherocytosis etc.

19.2

A 22-year-old male is brought into the Emergency Department with a decreased conscious state with a history of having been missing for over twenty-four hours. Results of his investigations are given below:

Parameter	Patient Value	Adult Normal Range
Sodium	149 mmol/L*	135 – 145
Potassium	6.0 mmol/L*	3.5 – 5.0
Chloride	114 mmol/L*	95 – 105
Bicarbonate	19.0 mmol/L*	22.0 – 26.0
Creatinine	210 µmol/L*	45 – 90
Urea	10.1 mmol/L*	3.0 – 8.0
Calcium	1.75 mmol/L*	2.10 – 2.60
Phosphate	2.29 mmol/L*	0.80 – 1.5
Magnesium	1.42 mmol/L*	0.70 – 1.30
Albumin	21 g/L*	35 – 50
Alkaline phosphatase (ALP)	62 IU/L	< 120
Gamma-glutamyl transferase (GGT)	22 IU/L	< 50
Alanine aminotransferase (ALT)	424 IU/L*	< 55
Aspartate aminotransferase (AST)	1679 IU/L*	< 50
Total bilirubin	12 µmol/L	< 19
T Protein	38 g/L*	60 – 82
Creatinine Kinase	10315 IU/L*	< 175

a) List five possible underlying causes that could lead to the abnormalities seen. (30% marks)

### ANSWER TEMPLATE

19.2

a)

- Crush/pressure injury
- Drug/Toxins
- Hyperthermia
- Prolonged status
- Inflammatory myopathies
- Infective – viral, bacterial myositis
- Neuroleptic malignant syndrome

19.3

The following results were obtained from a patient in the ICU:

Parameter	Patient Value	Adult Normal Range
Prothrombin time	15.0 s	10.0 – 15.0
International normalised ratio (INR)	1.20	0.80 – 1.20
Activated Partial Thromboplastin Time (APTT)	40.8 s*	25.0 – 35.0
Fibrinogen	2.0 g/L	2.0 – 4.0

a) List four possible causes. (20% marks)

## ANSWER TEMPLATE

19.3

a)

- Anticoagulants – e.g. heparin
- Lupus anticoagulant-type inhibitors
- Factor deficiencies – FXI, XII
- Artefactual

Maximum Score	8.8
Percentage Passed	83.7%

### Question 20

This organism was grown from an endotracheal tube (ETT) aspirate of a 67-year-old male with pneumonia.

Culture:

Light growth of *Klebsiella pneumoniae*

Antimicrobial Susceptibility

Amp / Amoxicillin	R
Amox/clav acid	R
Cefazolin	R
Cefotaxime	R
Cotrimoxazole	R
Ciprofloxacin	R
Gentamicin	R
Meropenem	R
Tigecycline	R
Ertapenem	R

a) What are the enzymes potentially responsible for antibiotic resistance? (10% marks)

b) How would you manage this clinical scenario? (90% marks)

## ANSWER TEMPLATE

a)  
*Klebsiella pneumoniae* carbapenemase (KPC)  
Metallo-beta-lactamases (MBL's – e.g. New Delhi metallo-beta-lactamase)  
OXA beta-lactamase  
(Only one required)

b)  
i. **Resuscitation and supportive treatment as indicated**  
ii. **Antimicrobial Therapy**

Use of antimicrobial dependant on clinical status of patient – avoid treatment if possible  
If treatment required recommendation is combination antimicrobial therapy  
Optimal combination is uncertain

Depends on further resistance pattern and enzyme present.  
Specialist ID opinion should be sought

Options:

1. Polymyxin-based regime (colistin or polymyxin B)
2. Meropenem (including high dose infusion) if isolate has acceptable MIC to meropenem as part of combination therapy
3. Ceftazidime-avibactam (limited availability in Australia)
4. Aztreonam
5. Can consider tigecycline as part of combination therapy

### iii. Infection control procedures

Isolate patient in negative pressure room

1:1 nursing

Avoid unnecessary movement in and out of room

Have anteroom available

Dedicated equipment within room

Contact precautions in addition to standard precautions:

Signage

Strict hand hygiene

Wear gloves/gowns on entering room

Appropriate disposal of contaminated equipment

Appropriate infectious clean of surfaces and room post discharge

Screening of other patients in unit.

Closed suction circuit if ventilated

Public health notification

*Examiner Comments:*

*Not well answered, with most attempts lacking structure, or understanding of all the relevant issues.*

Maximum Score	6.8
Percentage Passed	26.5%

## Question 21

What issues would you consider in providing renal replacement therapy to a 22-year-old patient with a traumatic brain injury and raised intracranial pressure?

How would you manage these issues?

### ANSWER TEMPLATE

Type of RRT:

Intermittent Hemodialysis likely to be associated with rapid fluid and solute shifts with increase in cerebral oedema and ICP – avoid.

CRRT better choice

Higher threshold for commencement in the context of raised ICP.

Risk of rebound intracranial hypertension if dialysate/replacement fluid sodium concentration is lower than plasma – consider using high sodium containing fluids

Consider using filtration rather than dialysis if possible to minimise fluid & solute shifts and rebound increase in cerebral oedema

Risk of hypotension when starting circuit and reduction in CPP: Start with small volume exchanges, ensure patient is not hypovolaemic prior, have vasopressor ready

Risk of circuit anticoagulation in traumatic brain injury leading to intracranial haemorrhage. Consider no anticoagulation, or strategies that only anticoagulate circuit – e.g. citrate

Consider placement of dialysis catheter – avoid jugular veins as risk of obstruction of venous outflow and haematoma

Use of RRT may affect temperature management

*Examiner Comments:*

*Candidates scored higher marks if they demonstrated sound knowledge of how parameters on the renal replacement prescription could be altered to improve safety for the patient.*

Maximum Score	7.3
Percentage Passed	46.9%

## Question 22

A 34-year-old male has been in the ICU for almost three weeks and has undergone several laparotomies following complex abdominal trauma. He appears to have nasogastric feed emanating from his dehiscence laparotomy wound and has developed a vasopressor requirement.

Give the likely diagnosis, and outline the principles of its management.

## ANSWER TEMPLATE

Enterocutaneous fistula (ECF) with inadequate source control

Or ECF with undrained collection

Or ECF with septic shock

- Management
  - Fluid and electrolyte
    - Match losses with crystalloid replacement
    - High sodium loss in high output fistulae
    - Supplement magnesium, phosphate and potassium
  - Sepsis management
    - Target antibiotics, antifungal
    - Source control
      - Surgical or percutaneous drainage of associated collections
      - Definitive surgical management may be delayed
      - Rule out other sources of infection
  - Nutrition
    - TPN often required particularly if proximal fistulae
    - Enteral intake may not be possible if < 75cm bowel remaining
    - Trial elemental feed if intolerant or increased output with polymeric feed
    - Role of zinc and vitamin supplement controversial
  - Wound management and effluent control
    - Principle is effective drainage allowing wound healing
    - Ostomy appliance

- VAC dressing controversial as may cause harm, but can be very effective in effluent management of high output fistula
- Reducing fistulae output
  - Reduce enteral intake and/or consider elemental feed
  - Antidiarrheal – loperamide
  - Somatostatin analogues – octreotide
- Definition of fistulae anatomy
  - Often difficult to define single source
  - Define and/or exclude distal obstruction
  - CT, fistulography etc

Definitive surgery - may be much later

*Examiner Comments:*

*Not well answered. Many candidates described a generic approach to intra-abdominal sepsis without considering the specific issues related to enterocutaneous fistulae.*

Maximum Score	7.2
Percentage Passed	30.6%

### Question 23

An 81-year-old female with critical aortic stenosis has a valve replacement procedure. Post-operatively she is diagnosed with an anterior spinal artery syndrome at the T6-T7 level on an MRI.

- a) Describe the signs you would expect on sensory examination of her lower limbs. (20% marks)
- b) What are the deep tendon reflexes likely to show? (20% marks)
- c) What perioperative factors may contribute to this syndrome? (30% marks)
- d) What therapies have been advocated to optimise spinal cord perfusion? (30% marks)

### ANSWER TEMPLATE

a) Sensory neurological examination of the lower limbs would reveal loss of pain and temperature sensation with a sensory level of T6-T7 with relative sparing of proprioception and vibratory sense below this level.

b) The acute stages are characterised by flaccidity and loss of deep tendon reflexes (with spasticity and hyperreflexia developing over ensuing days and weeks).

c) Prolonged aortic cross clamp, low perfusion pressure to the spinal cord as well as IABP, or ECMO are associated with spinal infarction

d) Mean arterial pressure is increased in increments of 10mm Hg every five minutes (with volume and vasopressor agents) until symptoms resolve, bleeding complications ensue, or additional blood pressure augmentation would cause an unacceptably high risk of bleeding at the surgical bed.

If a lumbar drain is in place, it should be opened and set to drain at 8 to 12mm Hg. If not in place, a lumbar drain should be placed if there is no response to blood pressure augmentation within 10 to 20 minutes.

*Examiner Comments:*

*The level of knowledge of basic neurology and of the use of lumbar drains was poor.*

Maximum Score	7.8
Percentage Passed	44.9%

## Question 24

Regarding randomised clinical trials:

- a) What is a noninferiority trial? (10% marks)
- b) What is the null hypothesis in a noninferiority trial? (10% marks)
- c) Why would a noninferiority trial be undertaken instead of a superiority trial? (40% marks)
- d) What are the limitations of noninferiority trials? (40% marks)

## ANSWER TEMPLATE

a)  
An active control trial which tests whether an experimental treatment is not worse than the control treatment by more than a specified margin. Originally conceived as “a safe alternative” treatment.

b)  
The null hypothesis states that the primary end point for the new treatment is worse than that of the active control by a prespecified margin, and rejection of the null hypothesis at a prespecified level of statistical significance permits a conclusion of noninferiority

c)  
Typically, a placebo controlled trial would be considered unethical as an established treatment already exists.

The investigators may consider the experimental treatment unlikely to be superior to established treatment or the current treatment is highly effective.

The experimental treatment may offer advantages such as safety (reduced adverse effects), better compliance, lower cost or more convenience.

d)  
Proving that two treatments are equivalent could mean that they are both ineffective or even harmful. Could lead to the acceptance of progressively worse treatments if noninferiority is blindly accepted with repeated noninferiority trials ('biocreep').

Conditions and practice may have changed since the original placebo trial of the current standard treatment.

Equipoise is more complex.

Analysis is more complex

A poorly conducted study tends to “noninferiority” as missing data and protocol violations favour noninferiority.

The margin by which non-inferiority is determined is arbitrarily decided by the researchers and may not be clinically appropriate

Sample sizes larger than placebo controlled trials

*Examiners Comments:*

*Very poorly answered. Evidence based medicine is an important part of the curriculum and the examiners were concerned at the low level of knowledge displayed. Some candidates appeared to list unrelated phrases from the EBM literature without any appearance of understanding.*

*The level of detail given in the template was not required to obtain a passing mark in this question.*

Maximum Score	6.5
Percentage Passed	4.1%

### Question 25

A 51-year-old male has just been transferred to the ICU from the surgical ward with worsening shortness of breath five days post-oesophagectomy, and a presumed anastomotic leak.

On arrival in ICU, he is tachypnoeic and extremely agitated.

Arterial blood gas analysis on FiO<sub>2</sub> 0.6 – 0.8 via reservoir (non-rebreathing) mask shows the following:

Parameter	Patient Value	Adult Normal Range
pH	7.12*	7.35 – 7.45
PaO <sub>2</sub>	50 mmHg (6.6 kPa)	
PaCO <sub>2</sub>	50 mmHg (6.6 kPa)*	35 – 45 (4.6 – 6.0)
HCO <sub>3</sub>	16 mmol/L*	22 – 28

Chest X-ray shows bilateral pulmonary infiltrates.

- a) List the possible causes for his respiratory failure. (20% marks)

The patient is intubated and mechanical ventilatory support is initiated.

- b) Describe the ventilator settings you will prescribe, giving the rationale for your decision. (60% marks)

Following intubation, there is no immediate improvement in the patient’s oxygenation.

- c) List the initial strategies that may be used to improve oxygenation. (20% marks)

### ANSWER TEMPLATE

a)

Differential diagnosis should include:

- ARDS secondary to sepsis from any source or other inflammatory insult including the following

- Pneumonia (hospital-acquired)
- Aspiration
- Atelectasis/pleural effusions/empyema
- Fluid overload secondary to resuscitation, renal failure
- Exacerbation of pre-existing condition e.g. heart failure, valvular heart disease, post-op ischaemia/MI, arrhythmia
- Lung diseases e.g. lymphangitis carcinomatosis

b)

- Use a mode with which one is familiar and aim to limit ventilator-associated lung injury, i.e. oxygen toxicity, barotrauma, volutrauma, shear stress and biotrauma
- Choice of mode (*any appropriate answer acceptable e.g. APRV for recruitment benefit, or volume assist control as staff familiarity and no one mode shown to have benefit over another*)
- Avoid over-distention of alveoli by keeping tidal volumes at 6-8 ml/kg (predicted body weight which in the ARDSnet studies was ~20% below actual body weight and calculated by a formula linking height and sex)
- Use PEEP to minimise alveolar collapse and derecruitment.
- Titrate PEEP to achieve a PaO<sub>2</sub> of 60 mmHg with lowest FiO<sub>2</sub> that is needed
- Permissive hypercapnea to avoid large minute volumes and alveolar injury through collapse and expansion of lung units

c)

- High FiO<sub>2</sub> (titrated to lowest possible level to limit toxicity)
- Confirm ETT position and patency
- Exclude readily reversible cause of hypoxia e.g. PTX, mucus plug, large effusion
- Increased inspiratory time
- Increased PEEP
- Prone positioning for at least 16/24 hours per day
- Ensure adequate cardiac output

*Examiners Comments:*

*Answered well overall. Lack of detail and structure in some answers.*

Maximum Score	8.3
Percentage Passed	79.6%

## Question 26

- a) Draw and label a diagram to show the key components of a continuous veno-venous haemofiltration circuit. (40% marks)
- b) The following pressures are displayed on your Continuous Renal Replacement Therapy (CRRT) machine that is providing continuous veno-venous haemofiltration (normal values are provided in brackets).

Access pressure: -240 mmHg\* (-50 to -150 mmHg)  
 Pre-Filter pressure 46 mmHg\* (100 to 250 mmHg)  
 Return pressure: 38 mmHg\* (50 to 150 mmHg)

Describe your approach to dealing with the problem. (40% marks)

- c) The problem resolves but the following day you are presented with a new issue.

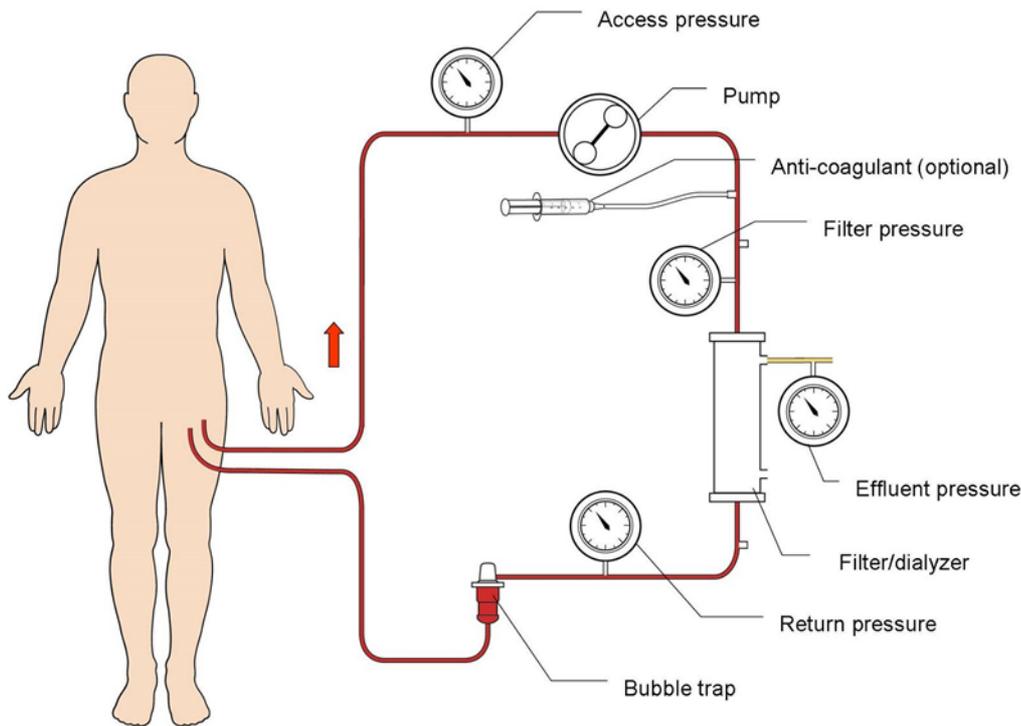
Access pressure: -110 mmHg (-50 to -150 mmHg)  
 Pre-Filter pressure: 450 mmHg\* (100 to 250 mmHg)  
 Return pressure: 40 mmHg\* (50 to 150 mmHg)

What is the likely cause?

(20% marks)

**ANSWER TEMPLATE**

a)



Either pre-or post-filter replacement fluid acceptable  
 Effluent pressure monitor not required

b)

Statement that this is a venous access problem

- Check patient: hypovolaemic? Potentially give volume
- Check settings: is blood flow excessive?
- Check proximal limb of circuit: kinking or clots?
- Access catheter: check for kinking due to insertion angle (replace) or clotting (try aspirating and flushing). Try withdrawing catheter slightly. Consider replacing catheter (different site, larger bore, longer catheter in femoral site, end-hole catheter instead of side hole)
- If all else fails try reversing lines

c)

Imminent clotting of the filter

*Examiners Comments:*

*This was answered well by most candidates.*

Maximum Score	8.8
Percentage Passed	87.8%

## Question 27

A patient who was extubated 2 hours ago following a drug overdose, becomes very aggressive in the ICU. He has punched one staff member, head-butted another and has become very violent in close proximity to the other patients.

Describe how you would manage this situation. Include the advantages and disadvantages of the drugs that could be used.

### ANSWER TEMPLATE

Call for help: Hospital emergency response (Code Black or equivalent)

May be a medical illness (hypoxia, hypoglycaemia, metabolic disturbance), psychiatric disorder (acute psychosis, drug-induced psychosis, delusional state, mania or personality disorder) or drug intoxication or withdrawal causing the aggressive violence.

Sedation to gain control of the situation may be required to allow such an assessment.

### Acute Management

De-escalation, containment and negotiation techniques if appropriate and most likely to work in a situation of low level threat (unlike this one).

Physical restraint – to allow delivery of drug therapy, need help / security team / police etc.

Chemical restraint:

i. Options:

1. Benzodiazepines:

- a. Diazepam / Midazolam / Lorazepam
- b. Advantages of rapid action, good safety profile
- c. Concern: Sedation / Drowsiness / Respiratory depression / hypotension/short acting

2. Anti-psychotics:

- a. Typical
  - i. Haloperidol
  - ii. Droperidol (increasing profile for relatively safe emergency sedation)
- b. Atypical
  - i. Olanzapine
  - ii. Risperidone

- c. Advantages – less respiratory depression, can be given im.
- d. Concerns: Extra-pyramidal side effects / QT prolongation / hypotension /slow onset, may require repeated administration

3. NMDA-antagonist (Ketamine):

- a. Advantage: Can be given im, much less respiratory depression or hypotension, rapid onset
- b. Concern: Hallucinations / Hypertension, tachycardia /

4. Intravenous anaesthetic agents (propofol, thiopentone)

- a. Advantage – very rapid action with guaranteed effect
- b. Concerns – apnoea, hypotension. May require intubation.

**(B) Post-intervention considerations.**

- a. Assessment and investigation for medical / psychiatric cause of severe agitation
- b. Adequate monitoring and support of vital signs
- c. Monitoring for adverse effects of medications used to control the individual
- d. Examination for injuries to the perpetrator
- e. Documentation
- f. Debrief – staff involved / perpetrator, when calm and rational other patients, perpetrator’s family
- g. Disposition – monitored environment

*Examiner Comments:*

*Most candidates omitted thinking about or looking for causes of aggression (e.g. hypoxia) and did not mention any post-intervention considerations.*

Maximum Score	7.3
Percentage Passed	49.0%

**Question 28**

A 35-year-old female is admitted to your ICU with community acquired pneumonia requiring 60% inspired oxygen via facemask. She is previously quite fit and well, and is currently 32 weeks pregnant.

Forty-eight hours later, she suffers a pulseless electrical activity (PEA) arrest.

- a) What is your differential diagnosis? (30% marks)
- b) Outline factors that may make successful resuscitation of this woman more challenging. (40% marks)
- c) What specific alterations would you make to the standard ALS algorithm in this woman? Justify your answer. (30% marks)

**ANSWER TEMPLATE**

a)  
Pulmonary Embolism (**must** state this to gain any marks in this section)  
Severe Hypoxaemia (airway obstruction/lung collapse/aspiration/AFE [see below])  
Amniotic Fluid Embolism  
Coronary ischaemia  
Tension pneumothorax / Tamponade (potentially post CVC etc., spontaneous unlikely)  
'iatrogenic' catastrophe/other: air embolism, drug error, anaphylaxis etc.  
Hypovolemia (unlikely unless massive concealed bleed but possible), placental abruption

b)  
Factors relate to the underlying cause of arrest, the woman’s state pre-arrest, the physiological changes of pregnancy and the presence of a gravid uterus/unborn fetus.

Underlying cause of arrest

Lack of a rapidly reversible cause such as pneumothorax /airway obstruction.

Woman’s state pre-arrest

Severe pre-existing/worsening hypoxaemia

Physiological Changes of Pregnancy

Airway oedema and increased incidence of difficult airway and airway bleeding, high oxygen consumption and increased minute ventilation, reduced FRC, increased risk of aspiration, supine hypotensive syndrome [aortocaval syndrome], procoagulant state, chest compressions may be challenging with obesity/breast enlargement

Presence of gravid uterus/unborn fetus

Prevention of supine hypotensive syndrome [aortocaval syndrome] requires lateral tilt but chest compressions should be performed supine with manual displacement of uterus [AHA rec: see below], reduced diaphragmatic excursion due to presence of uterus with reduced FRC, poor ECHO windows especially subcostal, need for resuscitative hysterotomy and potential simultaneous neonatal resuscitation, potential for delay/hesitation in delivering indicated treatment e.g. anti-arrhythmics, thrombolysis, extracorporeal support due to concerns regarding pregnancy.

c)

Main differences are

10-15 degrees of lateral tilt during chest compressions to avoid aortocaval compression or continuous lateral uterine displacement (LUD).

Early perimortem caesarean section

Early intubation

*Examiners Comments:*

*Candidates often gave a routine list for cardiac arrest causes (Hs and Ts) without much specific consideration of situation. Almost no consideration given to underlying cause and pre-arrest condition of patient as factors making successful resuscitation challenging. Often no justification given for alterations to ALS algorithm*

Maximum Score	7.8
Percentage Passed	77.6%

**Question 29**

You are tasked with developing a guideline for the post-operative ICU / HDU care of patients following bariatric surgery.

- a) How would you identify high risk patients who will require post-operative ICU / HDU admission? (30% marks)
- b) Discuss the important post-operative issues in these patients and their management. (70% marks)

**ANSWER TEMPLATE**

a)

**Pre-op risk assessment**

- Respiratory system evaluation
  - Pulmonary hypertension
  - Sleep apnoea
- Cardio-vascular evaluation and optimisation
  - Functional capacity
- Other considerations of relevance

- Diabetes, renal insufficiency, hiatus hernia, chronic pain and opioid tolerance issues, extreme weight

b)

### **Post-operative ICU Management**

- Monitored environment
  - HDU, preferably in ICU with 1:1 nursing supervision
  - Multi-specialty involvement with a shared mental model
- Respiratory management
  - Head end elevation and guard against aspiration
  - High risk of post-operative atelectasis
  - Extubation to NIPPV if appropriate
- Fluid management
  - Maintain intravascular volume fluid status while not causing edema of the anastomotic site due to excessive infusion, need for accurate monitoring of fluid status (invasive monitoring)
- Renal issues
  - Prone to rhabdomyolysis (prolonged surgery, steep trendelenberg position, high BMI)
  - High index of clinical suspicion (particularly if complaining of pain in the buttocks, hips or shoulders)
- Hyper-coagulopathy and increased risk of venous thromboembolism
- Close monitoring of glycaemic status and variability (insulin resistance); thyroid profile
- Regular (rather than prn) anti emetics
- analgesia – avoid opioids if possible
- Early mobilisation and physiotherapy, close attention to ICU housekeeping issues (FASTHUGS etc.)
- Altered pharmacokinetic profile in morbidly obese patients needs careful consideration.

Maximum Score	8.3
Percentage Passed	79.6%

### **Question 30**

*Please note: Marks for the following questions are equally distributed.*

- List five relative contraindications to the use of a heat and moisture exchange filter.
- List six precautions to consider when applying defibrillation pads.
- List five complications that may arise from use of an intraosseous needle.

### **ANSWER TEMPLATE**

a)

Haemoptysis, tenacious secretions  
 Patients with large air leaks  
 ARDS where controlling dead space is important  
 Large minute ventilation (e.g. > 10L/min)  
 Need for frequent nebulised medications  
 Long term ventilation (needs changing every 3-4 days)

- b)
- Avoid fluid – water, perspiration etc.
- Avoid excessive hair
- Avoid metal (metal-backed patches, piercings, jewellery)
- Do not place over bone
- Roll on to the skin to avoid air pockets
- Do not place over implanted pacemakers
- Avoid wounds / broken skin
- Ensure oxygen not flowing over pads

- c)
- Infection – cellulitis and osteomyelitis
- Extravasation of blood / infusion fluid / drugs
- Compartment syndrome secondary to extravasation
- Bone fracture or through and through penetration
- Damage to surrounding structures

Maximum Score	7.9
Percentage Passed	79.6%

## 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 82%, compared with 57% for the written paper and 61% for the Hot Cases. No viva had a pass rate under 50%. 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”**

34-year-old female, day 15 in ICU following a cardiac arrest during emergency LSCS. Previous failed extubation. Candidates asked to identify issues preventing ICU discharge. Clinical examination findings included bulbar palsy, gaze palsies, hemiplegia, clonus and weak cough. Discussion related to the stem and to the neurological findings as well as the possible causes of cardiac arrest.

44-year-old female, day 15 in ICU with meningoencephalitis. Candidates asked to examine her and provide a differential for the encephalopathy. Clinical findings included GCS 3, no corneal or cough or gag reflexes and a sternotomy incision from a thymectomy. Discussion was around treatment of autoimmune encephalitis and how the candidates would progress her care.

76-year-old male, day 2 in ICU with a history of end stage renal failure, infective endocarditis, recent hypoxia and an acute stroke. Candidates were asked to examine with an emphasis on his stroke management and suitability for extubation. Findings included a polycystic kidney, bilateral upgoing plantars, a new pacemaker, and obeying commands with the right arm only. A CT scan of a right MCA infarct was discussed. Other discussion included neurological care and prognosis, management of antibiotics and renal failure.

18-year-old female with Guillain Barre syndrome in ICU ventilated for 11 days. Candidates asked to examine her and formulate a management plan in the context of a new fever. Signs included fever, lack of reflexes, antigravity strength only and a painful swollen neck. Discussion included GBS management and variants, causes of fever, management of pain, weaning from the ventilator and complications of plasmapheresis

18-year-old male with 80% third degree burns. Candidates asked why he has a temperature. Findings included burns, tachycardia, noradrenalin infusion. Discussion focused on infectious vs non-infectious fever, management of pain and sedation and delirium, as well as management of carbapenem resistant enterobacteriaceae

43-year-old female, day 9 in ICU with acute liver failure following immunotherapy for melanoma. Candidates asked what had led to her altered level of consciousness and how they would investigate her. Findings were jaundice, no signs of chronic liver failure, low GCS, NAC infusion. Discussion around the causes of altered level of consciousness, the type of liver failure and possible aetiology and investigations

48-year-old male, day 11 in ICU ventilated with cervical spinal injury. Candidates asked to examine his neurology and outline related clinical issues. Findings were a C3 sensory level, C5 motor, TPN. Discussion was around the implications of the C3 injury, the approach to weaning from the ventilator and the care of the high C spine injured.

53-year-old male day 8 in ICU following multi trauma. Candidates asked to assess him and determine the main clinical issues and a management plan for the next 24 hours. Findings included right hemiplegia, signs of neck and shoulder surgery, facial fractures. Areas of discussion were the clinical findings, the causes of the hemiplegia, the reasons for anticoagulation in this patient.

59-year-old male, day 10 of ICU admission. Presented with blurred vision and diabetic ketoacidosis, with a significant background of diabetes mellitus and a perianal abscess. Currently in multi-organ failure. Candidates were asked to examine him to assess the current priorities for his management.

62-year-old male, day 2 of ICU stay. Transferred from another hospital one day after cardiac surgery on V-V ECMO. Background of hypertension, atrial fibrillation and mitral regurgitation. Candidates were asked to examine him and formulate a problem list.

51-year-old female, day 17 of ICU admission. Presented with respiratory failure and has been intubated for two weeks. Significant background of breast cancer and joint pains, which have been investigated with no diagnosis. Candidates were asked to assess her for possible causes of the respiratory failure and outline a management plan.

38-year-old male, day 8 of ICU admission. Post-operative combined liver transplantation and tricuspid valve repair. Failed extubation three days previously. Background of alcoholic liver disease and hepatorenal syndrome. Candidates were asked why the extubation attempt had been unsuccessful. Discussion points included management of sepsis, delirium and weakness.

70-year-old male, day 2 of ICU admission. Presented with low blood pressure following insertion of an AICD the previous day. Background of cardiac failure and multiple myeloma. Candidates were asked to evaluate the cause of the low blood pressure. Discussion points included recognition and management of cardiogenic shock.

61-year-old male, day 8 of ICU stay, with a diagnosis of pancreatitis. Background of ischaemic heart disease, and recent development of fever. Candidates were asked to plan his ongoing management and assess for the cause of his fever. Discussion points included interpretation of his CT scan, differential diagnosis of fever, and management of candidaemia, nutrition, and portal vein thrombosis.

52-year-old male, day 11 of ICU stay. Admitted with shortness of breath and hypoxic respiratory failure. Background of cirrhosis. Candidates were asked to assess him for the cause of the difficulty in weaning him from mechanical ventilation. Discussion points included interpretation of his CXR and BAL results, and issues relating to his conscious state and management of his renal failure.

69-year-old female, day 13 of ICU stay. Post-operative CABG following recent STEMI, complicated by cardiogenic shock. Extubated the previous day. Candidates were asked to examine her and identify current priorities for her management.

27-year-old male intubated and transferred from the country with severe community acquired pneumonia; currently ventilated but close to de-escalation of supports. Discussion centred around readiness for extubation.

64-year-old female, day 5 post on-table cardiac arrest during elective coronary angiography and stenting. She remained on significant support including ventilation and CRRT; and discussion centred around the causes and consequences of the arrest.

27-year-old female un-intubated and conscious woman with fever and shock; and with unequivocal signs of chronic severe R heart failure. This case required the ability to elicit clinical signs; in addition to a discussion around the potential causes of shock in this clinical context.

78-year-old male, day 1 post pulmonary thromboendarterectomy for chronic thrombo-embolic pulmonary hypertension (CTEPH). Case discussion was focussed on general ICU matters and the mechanisms of shock; recognising that this is an uncommon procedure limited to specific centres.

64-year-old male with cellulitis on a background of type 2 diabetes mellitus with systemic sepsis and a minimal noradrenaline requirement.

67-year-old female, day 7 post bilateral lung transplant. Discussion was focused around overall ICU progress and readiness for extubation.

87-year-old female, day 15 post emergency endovascular repair of a ruptured abdominal aortic aneurysm. She had been left with a complete mid-thoracic paraplegia; and discussion centred around the neurological findings and further management of this complication.

64-year-old man who was two days postop after three vessel coronary artery bypass graft with a background history of ischaemic heart disease, type II diabetes and obesity who was intubated and ventilated with drains still in situ was to be assessed for suitability to extubate. He was noted to have a pericardial rub and was still on dobutamine and amiodarone. He was warm and appeared confused and had intercostal drains, a pulmonary artery catheter sheath and backup pacing.

39-year-old male who was noted to have weakness in upper and lower limbs and was asked to be examined for a diagnosis and a discussion of a management plan. He was fully conscious with a tracheostomy and had obvious wasting of his upper and lower limbs and intact cranial nerve function except for a left glass eye. He was having trials of spontaneous breathing and his reflexes were slowly returning. He was being PEG fed.

82-year-old male who was five days in ICU after being injured at home when his car's handbrake accidentally self-released and pinned him between the car and a fence. He was noted to have a right lower lobe collapse and a haemopneumothorax with a chest drain in situ as well as fractured ribs on the right side. He had a background of bronchiectasis and prostate cancer but was living independently. He was intubated and ventilated and sedated. He was tolerating NG feeds with minimal aspirates and had good urine output. The candidate was asked to examine the patient for an approach to weaning him off the ventilator.

40-year-old male who was day 21 in ICU with a history of fever, confusion and multiple organ failure following multiple bowel resections four weeks ago. He was still intubated and ventilated on low-dose vasopressor support. The candidate was asked to identify the current issues on their assessment. He was noted to have new onset fever, fresh blood in his mouth and ileostomy and was clinically jaundiced. He was on lipid free TPN and had truncal and peripheral oedema.

## VIVAS

### Viva 1

You have been called to an emergency on the obstetric ward.

A 32-year-old female who has been in hospital for 4 days for management of hypertension has become acutely breathless. She is 28-weeks pregnant and has a past history of asthma.

What are the main differential diagnoses and how would you distinguish between them?

Maximum Score	9.5
Percentage Passed	76.3%

*(This viva dealt with the management of asthma in pregnancy.)*

### Viva 2

You are reviewing a 62-year-old male who was admitted to the ICU 10 days ago with acute pancreatitis. He has not tolerated enteral feeding.

He has a 30-pack year smoking history, and drinks between 4-8 standard drinks of alcohol per day.

He has been intubated and ventilated for 6 days and the staff are concerned about gradually worsening gas exchange.

Give a differential diagnosis for the deterioration in gas exchange and discuss your approach to assessment.

Maximum Score	10
Percentage Passed	86.8%

*(This viva dealt with the pathophysiology, diagnosis and management of abdominal compartment syndrome.)*

### Viva 3

You have been asked to assist with the management of a 70-year-old female in the Emergency Department who has presented with a history of altered conscious state and left sided weakness.

She has been intubated and has a blood pressure of 240/120 mmHg.

She has a history of ischaemic heart disease and atrial fibrillation. A CT scan of her head has demonstrated a large right sided temporo-parietal intracranial haemorrhage with intraventricular extension.

What are your initial management priorities?

Maximum Score	10
Percentage Passed	86.8%

*(This viva dealt with the management of intracranial haematoma, and strategies for dealing with poor neurological outcome.)*

## Viva 4

A 56-year-old male with history of gout and rheumatoid arthritis was admitted to hospital with 24-hour history of fever, generalised joint pains, fatigue, cough, shortness of breath and erythematous skin rash.

Over the next 24 hours, the rash worsened to involve his entire body (see clinical photographs below).

His chest X-ray showed widespread interstitial opacities and he rapidly progressed to type 1 respiratory failure needing intensive care.

Describe the skin lesions, provide a differential diagnosis and outline your initial assessment.

*(Images removed from report.)*

Maximum Score	9.8
Percentage Passed	71.1%

*(This viva dealt with Toxic Epidermal Necrolysis Syndrome (TENS).)*

## Viva 5

A 76-year-old male has presented 4 hours after onset of acute, severe chest and back pain. He is awake and responsive with a BP of 80/50 mmHg. His past history includes hypertension and 40-pack year smoking.

What are the life-threatening causes for this presentation and what clinical examination findings would you seek to differentiate between these causes?

Maximum Score	8.0
Percentage Passed	50.0%

*(This viva dealt with the diagnosis, management and complications of thoracic aortic dissection.)*

## Viva 6 – Procedure Station

This is a procedure viva. The Examiners will ask you specific questions regarding the situation below. You will be asked to demonstrate as well as explain some of your answers.

You are the incoming intensivist following changeover from a weekend.

You are taken to the bedside of a 25-year-old female. She is Day 4 in the ICU after diving into a river and hitting a submerged object, leading to near drowning and aspiration of a large volume of river water.

She has progressive bilateral infiltrates on chest X-ray and is requiring an FiO<sub>2</sub> of 0.6 and high levels of PEEP to achieve saturations of 88% and a PaO<sub>2</sub> of 60 mmHg.

How would you decide if prone positioning was an appropriate option for this patient at this time?

Maximum Score	9.0
Percentage Passed	52.6%

*(This viva dealt with prone positioning in respiratory failure.)*

### **Viva 7 – Radiology Station**

Maximum Score	9.7
Percentage Passed	76.3%

*(The radiology station consisted of two plain X-rays and four CT scans)*

### **Viva 8 – Communication Station**

A 46-year-old male has been in your ICU for 48 hours. He collapsed at home following sexual intercourse with his wife. A CT scan demonstrated a hypertensive intracranial bleed with intraventricular, subdural and subarachnoid extension which the neurosurgical team have determined is non-survivable.

Overnight he has been having extreme blood pressure surges, and this morning his left pupil has become dilated and unreactive. He is breathing spontaneously but laboriously on the ventilator. He is off all sedation, GCS 3, and has been for 24 hours. There are no other organ failures.

The intensivist who is handing over to you met with his wife yesterday. She has no friends or family support. The intensivist commented that the wife did not seem to accept the gravity of the situation, and said only that her church was praying for his speedy recovery.

You are now about to update his wife.

Maximum Score	8.4
Percentage Passed	52.6%