



Model Answers — Monash Practice SAQ Trial 2023.2

Table of Contents

Question 1 (18 marks).....	1
Question 2 (12 marks).....	3
Question 3 (12 marks).....	5
Question 4 (12 marks).....	8
Question 5 (12 marks).....	10
Question 6 (12 marks).....	12
Question 7 (12 marks).....	13
Question 8 (12 marks).....	14
Question 9 (18 marks).....	16
Question 10 (18 marks).....	19
Question 11 (12 marks).....	22
Question 12 (12 marks).....	24
Question 13 (12 marks).....	26
Question 14 (12 marks).....	27
Question 15 (12 marks).....	28
Question 16 (12 marks).....	30
Question 17 (12 marks).....	32
Question 18 (18 marks).....	34
Question 19 (18 marks).....	36
Question 20 (12 marks).....	38
Question 21 (12 marks).....	40
Question 22 (12 marks).....	42
Question 23 (12 marks).....	43
Question 24 (12 marks).....	44
Question 25 (12 marks).....	45
Question 26 (12 marks).....	46
Question 27 (18 marks).....	50

Question 1 (18 marks)

You are working in a tertiary trauma center and receive an ambulance pre-notification: A 29 year old female has fallen 2m off a ladder with suspected spinal cord injury. Her vital signs are within the normal range.

Part a (6 marks)

Complete the following table regarding spinal cord syndromes

Model answer

Syndrome	Physical finding	General prognosis
Anterior cord	Complete paralysis below lesion, loss of pain and temperature. Preserved proprioception/vibration	Poor
Central Cord	Quadiparesis upper limbs more than lower limbs. Some loss of pain/temperature sensation, more in upper limbs	Good
Brown Sequard	Ipsilateral spastic paresis, loss of proprioception and vibration. Contralateral loss pain and temperature	Good

Part b (3 marks)

In all blunt trauma patients, apart from neurological deficits, list three (3) indications for thoracolumbar spine imaging

Model answer

- Age > 60 years
- Patient not alert or unable to be evaluated
- Pain/deformity/tenderness to palpation of spine (accept only 1 from this category)
- High risk mechanism – fall from height, high speed MVA, pedestrian vs car, crush injury, ejection from vehicle (accept only 1 from this category)

Reference

AAST TL Spine Clinical Decision Rule

Part c (3 marks)

On arrival, you discover the patient is 26 weeks pregnant.

List three (3) positive clinical signs of placental abruption

Model answer

- Abdominal pain
- Tender uterine palpation
- PV bleeding
- Tetanic uterine contractions

Part d (3 marks)

Your registrar would like to perform an ultrasound to assess fetal wellbeing.

In pregnant trauma, list three (3) limitations of using ultrasound to assess fetal wellbeing

Model answer

- Poor sensitivity for detecting placental abruption
- Does not detect uterine rupture (poor sensitivity)
- Does not monitor foetal distress
- Distracts from maternal resuscitation

Part e (3 marks)

In addition to a standard trauma panel, list three (3) tests or investigations specific to pregnant trauma patients that you would consider.

Model answer

- CTG monitoring 4-6 hours (Mandatory answer, needs to include time component)
- Kleihauer-Betke (would accept test for fetal maternal haemorrhage)
- Vaginal secretions- pH or ferning on microscopy

NB would not accept bHCG, coagulation or blood group as this is considered part of most standard panels in trauma

Question 2 (12 marks)

A 27 year old male self presents with 3 weeks of increasing lethargy, exertional dyspnoea and recently night sweats.

His vital signs are as follows:

GCS	15
HR	97 bpm
BP	134/78 mmHg
RR	15 /min
SpO ₂	99 % on room air

Your working diagnosis is infective endocarditis.

Part a (7 marks)

Complete the table below with the two (2) major and five (5) minor clinical criteria that may assist you in confirming your diagnosis of infective endocarditis

Model answer

Duke's Criteria

Major	Minor
• Blood cultures positive for endocarditis • Evidence of endocardial involvement	• Predisposing heart condition/IVDU • Fever • Vascular phenomenon • Immunologic phenomenon • Microbiological evidence

Part b (4 marks)

List and justify four (4) investigations you would want to perform on this patient.

Model answer

Investigation	Justification
FBE	WCC high/normal/haemolytic anaemia
CXR	Cardiomegaly/pneumonia
TTE	Vegetation
Blood cultures	Seek and treat organism
UEC/Urine dip	Glomerulonephritis/haematuria
ESR	

Part c (1 marks)

List the heart valve most commonly affected in intravenous drug users with infective endocarditis.

Model answer

Tricuspid valve (45%)

Mitral Valve (30%)

Aortic Valve (20%)

Reference:

Dunn p551

Question 3 (12 marks)

A mother brings in her 7 month old baby after she accidentally spilled hot water from the Vick's warm steam vapouriser on to her baby's neck, part of the face and left forearm. She was waving it in front of his face while he was asleep to help him breathe as she thought he was sounding congested.

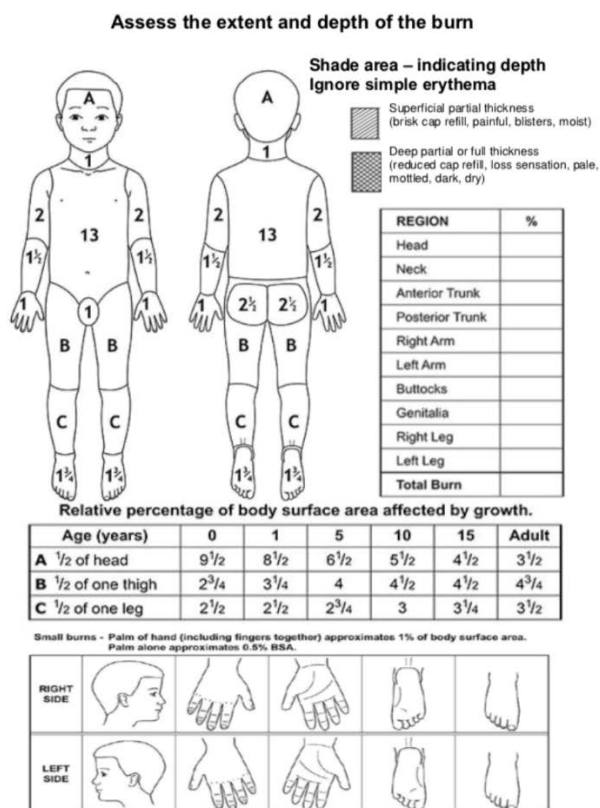


Part a (1 marks)

Estimate the % body surface area (BSA) of the skin involved

Model answer

1% for front of neck 0.25-0.5% for blister on forearm (one side of forearm-1.5%)



Part b (3 marks)

State three (3) important factors on history required in assessing the severity of the burn

Model answer

- time of accident
- first aid applied, was burn cooled immediately, what agents were used, how long was it cooled for
- temperature of the water and if there were chemicals/contaminants in the water
- duration of hot water on skin, were the clothes soaked, any jewellery removed)

(no marks for asking about NAI risk factors, comorbidities, child developmental stage, tetanus status)

Part c (5 marks)

List five (5) of your management priorities

Model answer

- check for airway and oral mucosal burns, ensure airway patency
- analgesia specify: (Note: IN Fentanyl contraindicated <1yr RCH guidelines) Ketamine ok if over 3mths,
- paracetamol, Ibuprofen, oxycodone) NOT topical LA
- cooling of the burns in cold water for 20 mins
- debride by gently rubbing of loose broken blistered skin and derroof blister
- clean wound and surrounds with saline
- dress burns with occlusive non-adherent dressing NOT circumferential/ encircling dressings to limb or
- Neck but secure with tubinet (Not Silver dressing on face or neck as it might cause staining)
- prevent hypothermia

IV fluids not indicated here for burns <10%BSA

Part d (3 marks)

Please state the patients disposition or follow up, after acute ED management, and two (2) points to justify your choice?

Model answer

Refer to plastics or burns team for admission/ follow up

Justification:

- Under 1 yr old
- Head and neck burn requires upright position to reduce oedema to soft tissues of neck
- Inadequate analgesia at home

NAI:

NAI albeit important to consider

1. Does not affect the severity of the burn so does not help in assessing the severity of the burn
2. Should not affect management of the burn

Concerns for NAI not a reason for admission under burns unit its more for the treatment of the burn

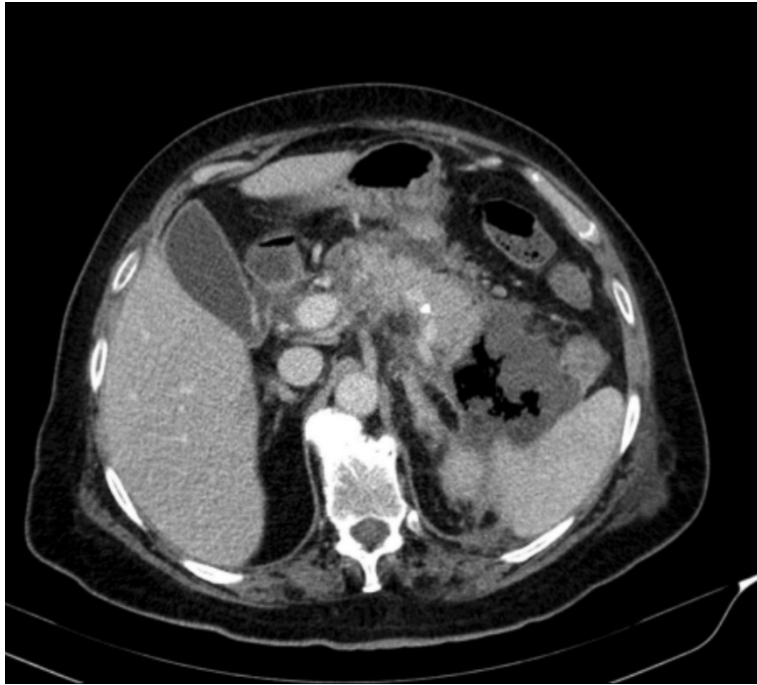
Assessment for NAI should be made in the ED, we don't admit patients to investigate NAI. IF we suspect NAI we do the mandatory reporting , refer to VFPMS (Victorian Forensics Paediatric Medical Service and decide whether the child is at risk if discharged.

Indications for admission for NAI : if is medically indicated, for social reasons if there is no persons they can be safely discharged to. Not all NAI get admitted because sometimes its the other parent or grandparent who bring the child in for assessment of suspicious injuries. Skeletal surveys and blood tests can be carried out by VFMOS.

Note: Child was actually discharged after discussion with burns unit RCH who will follow up in OP

Question 4 (12 marks)

A 65 year old man presents to your Emergency Department with central abdominal pain radiating to the back associated with nausea and vomiting. He appears unwell. Prior to your review, he has had a CT scan of the abdomen performed.



Part a (3 marks)

State two (2) points to describe the findings in the CT and provide an interpretation of this single slice CT image:

Model answer

Description:

- Delayed contrast CT abdomen single slice at the level of L1
- Ill defined pancreatic bed with peri-pancreatic oedema
- Possible calculus within the pancreatic duct
- Fluid within the left paravertebral space

Interpretation:

- Acute pancreatitis

Part b (3 marks)

List three (3) methods of stratifying the severity of this disease.

Model answer

- Ranson's criteria
- CT staging
- Serial CRPs
- APACHE score

Part c (3 marks)

List three (3) of the common causes of this illness

Model answer

- Ethanol use
- Trauma
- Steroid use
- Mumps
- Autoimmune
- Hypercalcaemia
- Drugs – e.g., thiazides.

Part d (3 marks)

List three (3) complications of this disease.

Model answer

- Intravascular volume depletion
- Sepsis
- ARDS
- Death
- Pancreatic pseudocyst
- Chronic pancreatitis
- Pancreatic endocrine and exocrine deficiency.

Question 5 (12 marks)

A 7-year-old boy is thrown from a horse and has sustained isolated injuries to the left lower leg as shown in the image and X-ray below.



Part a (3 marks)

Please state three (3) points in describing the injury as shown in the image and Xray

Model answer

- Appropriate description of tibial fractures
- Appropriate description of fibula fractures
- Description of wound/open fracture with tibia exposed

Part b (5 marks)

State five (5) steps in your immediate management in the emergency department

Model answer

- Provision of analgesia (many suitable options – must give appropriate dose/route)
- Splinting the limb +/- reduction pending access to theatre
- Antibiotics (appropriate drug and dose)
- Local wound care
- Urgent referral to orthopaedics
- Other reasonable answers

Part c (4 marks)

List four (4) complications of this injury

Model answer

- Infection
- Nerve injury
- Vascular injury
- Compartment syndrome
- Fracture malunion/non-union
- Complex Regional Pain Syndrome
- Other reasonable answers

Question 6 (12 marks)

Your tertiary trauma ED has received pre-notification that an 8-year-old boy has been crushed by a heavy set of shelving whilst playing in the shed. In extracting the patient, the AV crew have found that a piece of metal has penetrated his right chest. You have prepared a trauma team, however the child arrests as they arrive in the resus bay.

Part a (6 marks)

State your six (6) key priorities in resuscitating this child.

Model answer

- Rescuers should commence CPR while prioritising the search for and correction of any of the reversible causes of paediatric TCA.
- Control obvious external haemorrhage: pressure, tourniquets, long bone reduction / splinting, and pelvic binding.
- Haemostatic resuscitation: 20ml/kg warmed blood products 1:1:1, MTP activation, TXA 0.15mg/kg.
- Secure airway via intubation.
- Bilateral pleural decompression via thoracostomies.
- Proceed to ED resuscitative thoracotomy / decompress pericardium if conditions met (cardiac tamponade, arrest <10min).

Other reasonable points:

- Assisted ventilation FiO₂ 1.0 via T-piece or BVM.
- Maintain full spinal immobilisation.
- Commence APLS algorithm if primary non-traumatic cause identified / concurrent APLS if not distracting from TCA interventions / continue APLS for 10min post completion of TCA interventions

Part b (6 marks)

In paediatric trauma in general, state six (6) key factors that would influence your decision to cease resuscitative efforts.

Model answer

- Lack of response to life-saving trauma interventions.
- Prolonged duration of cardiac arrest eg. >10min cease completing trauma interventions.
- Persistently low ETCO₂.
- Cardiac standstill on POCUS.
- No reversible medical cause of arrest identified.
- No indications for prolonged CPR present (eg drowning, hypothermia).
- No social indications for prolonged CPR eg. Family attendance.

Question 7 (12 marks)

A 35 year old female patient has arrived at your emergency department with abdominal pain, vomiting and bloating. She is currently undergoing In Vitro Fertilisation treatment, and you suspect that she is suffering from Ovarian Hyperstimulation Syndrome.

Part a (4 marks)

List four (4) potential complications of Ovarian Hyperstimulation Syndrome.

Model answer

- Thromboembolism
- Hypovolaemic Shock
- Acute Kidney Injury
- Respiratory failure
- Ascites
- Hypertension
- Infection (chest, urine)
- Electrolyte disturbance (hypoNa, hyperK)
- Death
- Ovarian torsion

Part b (4 marks)

List four (4) ultrasound findings that can be associated with Ovarian Hyperstimulation Syndrome.

Model answer

- Enlarged ovaries
- Multiple ovarian cysts
- Ascites
- Pleural effusion
- Pulmonary oedema
- Pericardial effusion

Part c (4 marks)

What four (4) essential management strategies would you enact for this patient?

Model answer

- Analgesia (with appropriate detail)
- Fluid and electrolyte management (saline, albumin with appropriate detail)
- DVT prophylaxis
- Admission under gynaecology unit: consider ICU in severe cases

Other acceptable answers: consider drainage of ascites, empiric IV antibiotics

Maximum of 2 marks for this question if **DVT prophylaxis and admission** not included in candidate's answers.

Question 8 (12 marks)

A previously well 26 year old woman has presented after developing ptosis this morning which was preceded by a 24 hour history of tingling and numbness in her feet. She is a non-smoker and is not on any regular medications.

Her Vital Signs are:

GCS	15
BP	110/70 mmHg
HR	90 bpm
RR	18 /min
SpO ₂	99 % on RA
Temp	36.9 °C

Part a (4 marks)

Other than Guillain-Barré syndrome, list four (4) differential diagnoses

Model answer

- Paraneoplastic syndromes
- Myasthenia gravis
- Stroke syndrome
- Snake bite
- Trauma
- Diabetes
- Congenital
- Psychogenic
- Thiamine deficiency
- Arsenic poisoning
- Toxic polyneuropathies
- Systemic vasculitis
- Acute poly myositis
- HIV
- Sarcoid

Part b (2 marks)

List two (2) physical examination findings that would support the diagnosis of Guillain Barre Syndrome.

Model answer

Motor

- Weakness of limbs - symmetrical, often ascending
- DTR: Decreased or absent DTR

Sensory

- Paraesthesia in the hands and feet
- Pain often in the back

Autonomic

- Ileus
- HT Hypotension
- Fever
- Tachy or brady
- retention

Part c (2 marks)

List two (2) other examination finding you would perform as part of a Prognostic/Management examination

Model answer

- Bulbar muscle function
- Ventilation status
- Hemodynamic monitoring

Part d (2 marks)

List two (2) common causes of Guillain Barre Syndrome

Model answer

- Bacterial Infections eg Campylobacter
- Viral infections - CMV, Covid, influenza, HIV,
- Vaccinations - flu, covid, meningococcal, zoster
- Others

Part e (2 marks)

List two (2) investigations you may perform to confirm the diagnosis

Model answer

- CSF (elevated protein)
- Nerve conduction studies
- Antibody testing
- MRI
- Ultrasound

Question 9 (18 marks)

A 58 year old man has been found at his home with altered conscious state after a suspected ingestion of engine coolant liquid. Below are his observations (est weight 70 kg) and initial investigations results.

Obs:

HR	100 bpm
BP	145/80 mmHg
Temp	34 °C
Sats	98 % on RA
GCS	7 (E3, V1, M3)

pH	7.03
pCO ₂	23 mmHg
pO ₂	141 mmHg
Bicarb	6 mmol/L
BE	-23 mmol/L
Sats	78.3 %
Na ⁺	149 mmol/L
Cl ⁻	112 mmol/L
K ⁺	4.9 mmol/L
Lac	21 mmol/L
Glucose	4 mmol/L

		Reference range
Sodium	149 mmol/L	(135-145)
Potassium	5.0 mmol/L	(3.5-5.2)
Chloride	114 mmol/L	(95-110)
Bicarbonate	14 mmol/L	(22-32)
Urea	17.3 mmol/L	(3.0-8.4)
Creatinine	261 umol/L	(60-110)
GFR (mL/min)	22	(> 60)

Serum Lactate: 8

Serum Osmolality: 335 mosmol/Kg (275-300)

Part a (4 marks)

List four (4) findings with associated calculations, if needed, from the above results that are suggestive of ethylene glycol toxicity.

Model answer

1. HAGMA - Anion Gap = $\text{Na} - (\text{Cl} + \text{Bic}) = 149 - (112+6) = 31$

2. Elevated Osmolar Gap

Calculated Osmolarity = $2\text{Na} + \text{Gluc} + \text{Urea} = 2*149+4+17 = 319$

$335 - 319 = 16$

3. Elevated Lactate

4. Acute Renal Failure with elevated Creatinine

Part b (2 marks)

List two (2) further findings on other investigations that if elevated or abnormal, are pathognomic for ethylene glycol toxicity.

Model answer

1. Hypercalcaemia
2. Calcium Oxalate crystals on Urine microscopy

Part c (6 marks)

Complete the table below for the 3 stages and features of ethylene glycol toxicity.

Model answer

Stage	Time period	Features
1	1 - 12 hrs	Ataxia, slurred speech, drowsiness
2	6 - 24 hrs	HAGMA, Tachypnoea, Tachycardia, Hypertension, Decreased GCS
3	24 – 72 hrs	Progressive acidosis, Acute Renal Failure, Hypocalcaemia, Seizures, Coma, Death

Part d (6 marks)

State six (6) steps in the management of this patient, assuming that the patient is already in a Resus cubicle with IV access and physiological monitoring attached.

Model answer

- i. Intubate for airway protection and hyperventilation (sensible plan accepted with drugs/doses)
- ii. Sodium Bicarbonate to correct pH to 7.30 (bolus of 1-2 mL/kg 8.4% solution)
- iii. Correct hyperglycaemia and Electrolyte abnormalities eg Hypokalaemia, Hypomagnesaemia or Hypocalcaemia.
- iv. Commence Ethanol via NG tube, 4 x 30ml shots of vodka (70kg). Maintenance with 30ml shot hourly (target serum ethanol concentration of 0.1-0.15 g/dL)

Or

Fomepizole 15mg/kg IV loading + Maintenance 10 mg/kg IV every 12 hours for 48 hours.

v. Pyridoxine 100mg IV Q6H Or Thiamine IV 100mg Q6H

vi. ICU admission for Haemodialysis.

Question 10 (18 marks)

A 43 year old woman arrives via ambulance to your regional ED at 8pm. She had a sudden worsening of a 2 day long headache with associated conscious collapse and vomiting while at a restaurant. Her friend thought she may have anaphylaxis so administered her own EpiPen to the patient.

On initial assessment, her vital signs are within normal limits. She appears agitated and is continuing to vomit profusely.

Part a (4 marks)

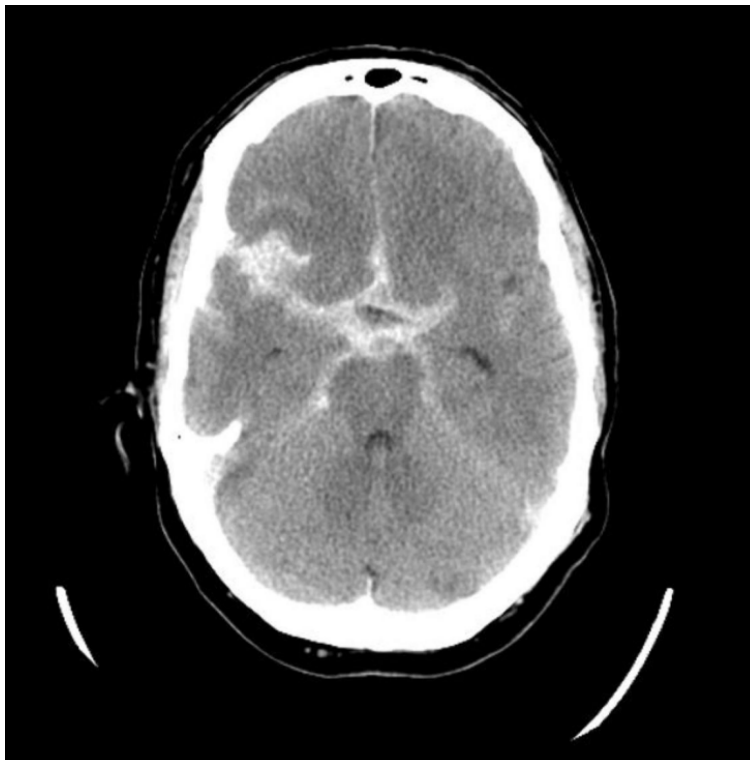
Aside from Ondansetron and Metoclopramide, prescribe two (2) other antiemetics you could use for this patient. For each one list a potential dangerous side effect.

Model answer

Drug/Dose/Route of administration	Side effect
Droperidol 0.625mg IV	• Drowsiness/sedation • Drooling • Extrapyramidal side effects – akathisia, uncontrolled movements of the body, esp face and neck • Tachycardia • Hypotension
Cyclizine 25-50mg IV	• Sedation • Tachycardia • Psychomotor impairment • Anticholinergic side effects
Dexamethasone 4-8mg IV	• Blood glucose instability • May increase agitation
Prochlorperazine 5-10mg IM or 2.5-10mg IV	• Sedation • Extrapyramidal side effects • Anticholinergic side effects
Chlorpromazine 25mg IM or 12.5mg IV	• Sedation • Extrapyramidal side effects • Anticholinergic side effects • Hypotension

Part b (2 marks)

The patient undergoes an urgent CTB.



List two (2) findings seen on this single view of a non contrast CTB.

Model answer

1. SAH
2. Hyperdense expansion at MCA – likely rupture of aneurysm
3. Sulcal effacement

Part c (8 marks)

The patient has a drop in GCS to 6/15 and a decision is made to intubate her. Given her diagnosis, list four (4) potential complications that could occur during intubation and a measure you would take to prevent them.

Model answer

Potential complication	Prevention measure
Hypotension	• Have IV fluid hanging and ready to bolus. • Metaraminol drawn up ready to bolus as needed • Use cardiac stable drugs for induction eg ketamine, fentanyl (as compared with propofol)
Hypoxia	• Pre oxygenate with 15L via face mask • Apnoeic oxygenation via NP
Aspiration	• Suction ready at bedside • Antiemetics pre intubation • Head up slightly for intubation

Seizure	• Propylactic load with Levetiracetam • Have Midazolam drawn up to give if acute seizure
Incorrect placement of ETT	• Use videolaryngoscopy + bougie or introducer to enable placement • Most experience operator to intubate
Raised ICP	• Ensure adequate sedation and paralysis prior to intubation • Blunt laryngeal response
Hypertension	• Ensure adequate sedation and paralysis prior to intubation to avoid increased agitation and spikes in BP • Have ongoing sedation ready
Anaphylaxis to medications	• Check allergies carefully pre induction

Part d (4 marks)

The patient has been accepted for transfer by road to a neurosurgical centre that is 45 minutes away.

List four (4) priorities in the preparation of this patient for transfer

Model answer

- Prepare patient – nurse head up to 30 degrees, maintain normal BP, Na, Glucose, Na. Ensure all tubes/lines taped and secured.
- Prepare equipment - enough battery/cords for pumps and ventilator. BVM, laryngoscope in case of need for re-intubation, intubation equipment.
- Prepare drugs to take – sedation, vasopressors, mannitol, IV fluids, intubation drugs.
- Ensure communication with receiving team – bed available, where in the hospital, relevant accepting team members – and with family
- Documentation, films/disc with images – provide copies to take to receiving hospital

Question 11 (12 marks)

A 41 year old male (80kg) is brought to your rural ED in an altered conscious state after a polypharmacy overdose 60 minutes prior to your assessment. He was found by his partner with empty packets of the below medications surrounding him.

Amitriptyline	10 mg x 20 tablets = 200 mg
Amlodipine	5 mg x 50 = 250 mg
Candesartan	16 mg x 20 = 320 mg
Carbamazepine	200 mg x 20 = 4000 mg
Paracetamol	500 mg x 20 = 10 g

Their observations are:

Temp	37.0 °C
HR	110 bpm
BP	100/40 mmHg
RR	22 /min
SpO ₂	96 % on Room Air
GCS	11 (E3, V3, M5)

Part a (4 marks)

Fill in the below table to list the two (2) most concerning aspects of their overdose and provide justification

Model answer

Medication	Justification
Carbamazepine	Severe toxicity (50mg/kg) – coma, seizures, resp depression, potential Na Channel blockade
Amlodipine	Potential profound vasoplegia – as taken in combination with ARB

Part b (5 marks)

The patient develops worsening haemodynamic instability. They are intubated and have an arterial catheter and central venous catheter placed.

State five (5) management steps, in order of escalation, in relation to this patient's developing haemodynamic instability as a consequence of their overdose. Give drug doses as required.

Model answer

- Fluid bolus 10-20ml/kg aiming for MAP >65mmHg and monitoring for signs of pulmonary oedema given potential myocardial depression
- Calcium Gluconate 30ml (3g/6.6mmol) IV over 5-15 minutes and repeat up to 3 times aiming for iCa 1.5-2.0

- Noradrenaline starting at 5mcg/min and titrated to MAP > 65mmHg
- Sodium Bicarbonate 8.4% 1ml/kg aiming for pH 7.50-7.55 if evidence of sodium channel blockade
- HIET if echo shows myocardial depression

Other options after reasonable initial management are

- Vasopressin if refractory to Noradrenaline
- methylene blue

ECMO not allowed given rural centre unless included as part of retrieval referral

Part c (3 marks)

State three (3) indications for giving activated charcoal in the setting of paracetamol overdose

Model answer

- Acute single ingestion >10g or 200mg/kg of immediate release < 2 hours post ingestion
- Massive (>30g) acute single ingestion immediate release paracetamol < 4 hours
- Acute single ingestion >10g or 200mg/kg of modified release paracetamol <4 hours post ingestion

Question 12 (12 marks)

A 50-year-old female is transferred to your Emergency Department as her GP is concerned that she is having a psychotic episode.

Part a (1 marks)

State the definition of psychosis

Model answer

DSM V: five key symptoms of psychotic disorders:

- delusions
- hallucinations
- disorganized speech
- disorganized or catatonic behaviour
- negative symptoms.

NIH: 'gross impairment in reality testing'

Folstein's MMSE: MMSE < 20

Part b (5 marks)

List five (5) factors that you would seek in her history that would support a psychiatric illness over a medical illness as the likely cause.

Model answer

- Family hx of psychiatric disorder
- Past psychotic illness
- Slow onset
- Premorbid slow deterioration in social/family/employment
- Recent significant life event
- Non-adherence to psychiatric medication
- Auditory hallucinations
- Structured delusions

Part c (6 marks)

You suspect a first episode of psychosis. The patient is distressed and agitated, posing an emergent risk to herself and others. She declines any oral medication.

Complete the following table regarding first line parenteral benzodiazepine options you would consider for situational control including four (4) potential side effects.

Model answer

Medication Dose & Route Adverse event/Side effect

- Midazolam
- Lorazepam
- Diazepam

Appropriate dose and route

- Hypotension
- Respiratory depression
- Oversedation
- Paradoxical excitation reaction

Medication	Dose & Route	Adverse event/Side effect
Midazolam Lorazepam Diazepam	Appropriate dose and route	1. Hypotension 2. Respiratory depression 3. Oversedation 4. Paradoxical excitation reaction ((Didn't accept anaphylaxis as it is extremely rare and other more important answers were overlooked such as hypotension))

References:

1. Cameron's Adult Emergency Medicine (5th edition)
2. Rosen's Emergency Medicine (10th edition)
3. DSM-V
4. NIH

Question 13 (12 marks)

A 49 year old man has presented with syncope. He collapsed without any warning or prodrome and recovered within a few minutes. He did not sustain any injuries & did not have a head strike.

He has no known past medical history and is on no regular medications.

Part a (5 marks)

List five (5) high risk features on an ECG in this context

Model answer

Any 5 of the following, bold required to get full marks they need to describe the ECG findings not just state the condition otherwise 0.5 mark.

- Conduction abnormalities
- HOCM
- Brugada
- ARVD
- RV infarct
- Long/ short QT
- DCM, WPW
- LVH due to Aortic stenosis

Part b (3 marks)

List three (3) features you would look to exclude on a bedside ECHO

Model answer

Bedside ECHO- looking for...dissection flap/RWMA/RV strain/dilatation/aortic stenosis

Part c (4 marks)

Unfortunately after a long wait in a busy department & with all investigations pending, he wants to leave against medical advice.

Outline four (4) steps in how you would manage this scenario

Model answer

Answer should include

- trying to understand reasons for leaving & attempt to explain reasons for staying
- attempt to compromise e.g. persuade to stay for ECG & reassess
- recruit family/alternative health care provider
- facilitate safe d/c if all else fails with GP follow up and outpatient investigations

Ref: Dunn

Question 14 (12 marks)

You are tasked to investigate a critical incident in your emergency department. A patient represented to your department with anaphylaxis requiring ICU admission 2 hours after being discharged by the waiting room team with “a bit of an allergy.”

Part a (4 marks)

State four (4) actions you would take in investigating and managing this incident

Model answer

- Open Disclosure to patient and family
- Investigation (examine records, interview staff)
- Reporting (eg. Electronic incident system, RCA, medicolegal)
- Education (inc. M&M)
- Feedback (debrief staff, counsel JMO, family)
- Recommendations

Must give open disclosure to score full marks in this sub-question Other appropriate answers will be accepted

Part b (8 marks)

You read a cohort study examining the prevalence of this condition.

Complete the following table detailing the differences between prospective cohort and case-control studies

Model answer

Timeline of investigation?	Retrospective	Prospective
Ideal for study of rare...?	Rare conditions	Rare exposures
Biggest bias issue?	Recall bias	Loss to follow-up bias
Can simultaneously evaluate multiple...?	Risk factors	Outcomes

Question 15 (12 marks)

Your Emergency Department director has noted your previous clinical acumen in caring for older people. They have asked you to provide input into developing standards of care for this population within the department.

Part a (6 marks)

State six (6) SPECIFIC risks posed to older patients attending an emergency department.

Model answer

Accept 6 of the following (6 marks):

- Pressure Injuries
- Delirium
- Falls
- Nosocomial infections
- Medication Errors (due to polypharmacy)
- Diagnostic error (due to atypical / subtle presentations of disease)
- Under-recognition of pain (accept under-treatment of pain)
- Not aligning ED care with existing patient goals of care
- Under-recognition of the impact of frailty (see definition) as high risk for admission
- Increased risk of communication in handover to/from community care-givers (e.g. interim medication orders, discharge communication, outcomes of discussions)

Part b (6 marks)

Thinking about emergency department design, state six (6) SPECIFIC features that can prevent harm for an older person accessing ED care.

Model answer

Accept six of the following:

TAKEN verbatim from the policy

Important elements of an older person-friendly environment include attention to the following in ED design:

- Ensuring privacy for the older person and their family (wherever possible).
- Way-finding that supports safe and timely navigation:
 - Signage that facilitates navigation.
 - Toilet facilities that are easily identifiable and that provide contrasted colours of toilet door and toilet seat from walls and floor respectively.
- Lighting:
 - Access to natural lighting.
 - Lighting that supports navigation particularly at night for access to bathroom/toilet facilities.
- Hearing and noise:
 - Attention to noise levels and implementation of noise-reduction strategies.
 - Use of hearing-loop technology.
- Support surfaces:

- Availability of pressure reducing surfaces.
- Availability of reclining chairs that offer an alternate to ED trolleys where clinically appropriate.
- Falls risk reduction:
 - Removal of safety hazards such as loose cords and clutter.
 - Glare reduction.
 - Flooring that minimises falls risk or injury from falls.
 - Ensure that trolleys can be lowered enough for older persons to safely get on and off.
 - Where appropriate, encourage regular walks and toileting.
- Temporal orientation cues within treatment cubicles and waiting areas.
- Visible wall clocks.
- Call bells that are within reach and functional.
- Where indicated, provision of food and fluids appropriate to the older persons needs including texture-modified food and fluids.
- Ensuring access to physical and functional aids and distraction therapies.
- White communication boards for each bed which display the patient journey of the older person, their likes and dislikes and if they have special needs or requests.
- Family/whānau rooms that are inviting and comfortable.

It should be noted that an older person-centred environment is a suitable environment for younger patients. Conversely, an ED environment tailored to younger persons may not be fit for purpose for older persons.

Question 16 (12 marks)

A 10 year old boy with known haemophilia A presents to the emergency department with an atraumatic painful ankle. He is systemically well. His X-Ray shows no fracture. His weight is 30kg and his vital signs are normal.

Part a (1 marks)

What is Haemophilia A?

Model answer

X-linked Congenital Deficiency of Factor 8

Part b (3 marks)

Complete the table with the concentration of clotting factor for each level of severity

Model answer

Severity	Percentage of residual active factor
Mild:	5-40% active factor 8
Moderate:	1-5% active factor 8
Severe:	<1% active factor 8

Part c (1 marks)

What is the likely diagnosis?

Model answer

Haemarthrosis (most common presentation of Haemophilia A)

Part d (2 marks)

List two (2) supportive management steps

Model answer

1. Analgesia: oral paracetamol 450mg, oxycodone 2.5mg, avoid NSAIDs
2. Splinting/Immobilisation/Crutches/Ice/Rest/compression/Elevation

Part e (3 marks)

State the specific management, including dose(s) and target

Model answer

Recombinant factor 8

1 unit/kg raises activity by 2%

Target 50% activity in haemarthrosis

Thus $25\text{u/kg} = 25 \times 30 = 750$ units

RCH:

Day 1: 40 units/kg

Day 2: 40 units/kg

Doses should be rounded up to use whole vials

National Blood Authority Guidelines - Haemarthrosis desired level 40–60 (units/dl)

If bleeding does not stop, a second infusion may be required. If so, half the initial loading dose should be repeated in 12 hours

Note: Non-factor treatment: Efficizumab (Hemlibra) monoclonal antibody directed toward factor IXa and factor X, and mimics function of factor VIII

Creates an equivalent factor VIII level of approx 10%. Effective in children with haemophilia A. Not intended to treat acute bleeding episodes

Desmopressin (DDAVP) use in mild haemophilia A - releases stored factor VIII and von Willebrand factor into circulation

It is not adequate as a single agent to achieve haemostasis in major bleeding

TXA for epistaxis, not haemarthrosis

Special considerations for the treatment of children with inhibitors (antibodies) to factor VIII. This Mx is complex and the haemophilia treatment centre should be consulted. Treatment and prevention of bleeding in children with inhibitors is managed with bypassing agents eg Novoseven®RT, FEIBA®

Part f (2 marks)

How would this dose be altered in the setting of an intracranial haemorrhage, and why?

Model answer

Target 100% activity in life-threatening bleeds - Thus $50\text{u/kg} = 1,500$ units

Or 75 units/kg

Desired level 80–100 units/dl

Question 17 (12 marks)

42 yo female presents to ED with abdominal bloating. She has a past history significant for Schizophrenia for which she takes Clozapine. She has been compliant with her medication.

Below is an AXR taken in the Emergency Department



Part a (3 marks)

List two (2) findings on this AXR and provide an interpretation

Model answer

1. Gross colonic dilatation
2. No transition point/Gas through to rectum

Interpretation: Pseudo-obstruction likely secondary to Clozapine

Part b (2 marks)

Excluding the above stated pathology, list two (2) other serious complications of clozapine.

Model answer

1. Agranulocytosis
2. Myocarditis

Also- cardiomyopathy, seizures, NMS (source NPS medicine wise)

Part c (3 marks)

The surgical registrar asks for a CT abdomen.

List three (3) findings you would assess for on the CT.

Model answer

- Perforation
- Bowel ischaemia
- Faecal impaction, transition point, other reasonable

Part d (4 marks)

The patient deteriorates significantly. Despite this, they want to leave against medical advice.

State four (4) principles that need to be met for a patient to be detained under the mental health act

Model answer

- Person appears to have a mental illness
- Because of that mental illness they need immediate treatment to prevent serious deterioration in their physical or mental health (or serious harm to another person)
- If made subject to act is able to be assessed
- There is no less restrictive means to safely manage the patient

Question 18 (18 marks)

A 14 day old term baby is brought to your suburban mixed ED at 6am. Parents reported the breathing rate seemed a little higher than usual yesterday and he did not wake to feed overnight. This morning he is blue, mottled and inactive with poor tone.

Vitals signs on arrival are:

HR	240 bpm
RR	38 /min
SpO ²	81%

Non-Invasive BP is not recording well.

Birth weight 3.0 kg

Part a (5 marks)

List five (5) key early differentials

Model answer

- Sepsis
- Congenital cardiac disease / duct-dependent cardiac lesion
- Inborn error of metabolism
- Non-accidental injury
- Asphyxia/suffocation

Note “BRUE” is an inappropriate answer here and should get no marks. “near miss SIDS” also antiquated and inappropriate.

Need to have each of sepsis, a cardiac cause and a metabolic cause for full marks

Part b (6 marks)

List your six (6) initial management steps; for any drugs given please provide dose and route:

Model answer

Supported resps – this should really be in an age appropriate fashion such as an infant t-piece or neopuff. Other infant-appropriate methods of o₂ delivery may get a mark in appropriate answer but not generic oxygen delivery answers eg 15L hudson NRB

IV fluid bolus upon access w doses, endpoints

Pressors

Antibiotics – cefotaxime 50mg/kg benzylpenicillin 60mg/kg or similar spectrum

Prostin

Glucose correction with appropriate doses

Intubation/ crit care referrals and transfer

Part c (1 marks)

The baby develops progressive bradycardia.

Below what HR are chest compressions indicated?

Model answer

Suggested answer: 60 bpm

References:

compressions below HR 60

<https://www.anzcor.org/home/paediatric-advanced-life-support/guideline-12-2-paediatric-advanced-life-support-pals/>

<https://www.anzcor.org/home/neonatal-resuscitation/guideline-13-6-chest-compressions-during-resuscitation-of-the-newborn/>

Does not matter which of the above algorithms the sitting candidate considers themselves to be in, rate is still 60.

Part d (6 marks)

Unfortunately, the child dies 20 mins after arrival and resuscitation attempts are unsuccessful.

After the team has ceased resuscitation attempts, list six (6) further steps that need to take place.

Model answer

Will be a variety of acceptable answers here:

- Clear but compassionate communication of death to family
- Space to sit with child ideally in a private room with time period to be determined by them
- Support for family: spiritual, pastoral, psychological as appropriate
- Coronial referral for investigation, consideration of postmortem
- Debrief team, arrange support for staff
- Documentation
- Communicate info to family GP
- Quality review of case – ideally included for full marks (may be worded a variety of ways)

Support of family necessary for full marks

Several candidates answering they would write death cert and report to coroner – note these are mutually exclusive.

Question 19 (18 marks)

You are the consultant in-charge in a rural Emergency Department. You received a pre-notification from the ambulance about a 81-year-old man who drank 1L of organophosphate 30 minutes ago and took 20x of his Glibenclamide.

Part a (1 marks)

The ambulance officers have just arrived at the scene.

What type of contact precaution will they require before walking into the scene?

Model answer

Universal precautions

(Sensible answers accepted)

Part b (3 marks)

The ambulance will arrive in 15 minutes.

List three (3) crucial preparations prior to their arrival

Model answer

Needs to be specific to this scenario - Transferring patient to area, preparing roles and monitoring is non-specific

Answers may include

1. Decontamination - washing patient soap and water
2. prepare for difficult intubation
3. resource large doses of atropine - pharmacy, other departments
4. resource pralidoxime and octreotide

Arranging retrieval is not an immediate priority in 15 minutes that patient will arrive.

Part c (8 marks)

List eight (8) clinical features you will seek in your assessment

Model answer

Clinical features of cholinergic syndrome and sulphonylurea overdose (some clinical features overlap).

Excess salivation, bronchorrhoea, agitated delirium, seizures, bradycardia or tachycardia, coma, vomiting/diarrhoea, blurred vision, muscle weakness, muscle twitching/tremors

Part d (6 marks)

List three (3) pharmacological agents you may require in this setting (including dose, route and end-point)

Model answer

Drug	Dose/Route	End point
Atropine	1200mcg IV initially doubling every 5 mins	Drying of secretions, resolution of bradycardia,
Pralidoxime	2g in 100ml N saline then infusion 500mg/hr IV	Fasciculations and muscle weakness resolved
Octreotide	50mcg IV bolus then 25mcg/hr IV over 24 hours	Stabilisation of BSL's

Question 20 (12 marks)

A 26-year-old man with a history of schizophrenia and polysubstance abuse has been brought to your department in an agitated state. Following assessment, he is placed on an involuntary treatment order and a high dependency psychiatric admission is planned.

Part a (6 marks)

State six (6) distinct reasons why patients experiencing an acute psychiatric illness are at an increased risk of medical illness.

Model answer

Any reasonable, yet distinct, variations of the following conceptual points:

- Self-neglect e.g., starvation, dehydration, deficiencies.
- High risk behaviours e.g., Trauma, assault, STIs, etc.
- High rates of concurrent substance abuse.
- High risk of ETOH or substance withdrawal.
- Suicide attempts / intentional overdoses.
- Higher rates of chronic illness due to lifestyle / social determinants of illness.
- Exacerbations of chronic illness more likely.
- Concomitant social dysfunction; exacerbating access to health care.
- Other reasonable variants...

Part b (6 marks)

Your quality team is reviewing the increasing occurrence of long ED stays for patients requiring acute mental health admission. In doing so, they review the 2022 ACEM policy on 'Access to Care for Patients with Acute Mental and Behavioural Conditions'.

State six (6) recommendations of this policy that support the optimal care of patients with mental and behavioural conditions.

Model answer

Any reasonable, yet distinct, variations of the following conceptual points:

- All patients should have a right to access high quality regardless of whether they are physically and/or mentally unwell or distressed.
- The role of the ED should be limited to assessment, stabilisation, and referral.
- Emergency departments are inappropriate for ongoing care for patients requiring admission / are high stimulus environments / total time should be in keeping with ACEM Hospital Access Targets.
- Mandatory notification to relevant authorities should occur for stays >24hrs.
- Acute mental / behavioural conditions should be triaged in line with ATS category.
- EDs should ensure multidisciplinary teams are utilised in assessment and management.
- Mental health should occur in parallel with physical assessment.
- Clinical judgement of level of intoxication, rather than BAL, should determine decision making or assessment capability.
- Observation may be warranted to determine if symptoms resolve as intoxication levels decrease, but this should not delay a mental health assessment.
- Patients should receive culturally responsive and trauma-informed care.

- EDs should ensure safety for all persons via policies, procedures, training and staffing to prevent violence.
- Documentation and sharing of information.
- Quality processes, performance reviews.
- Several other reasonable options...

Ref:

ACEM Policy P41: Access to Care for Patients With Acute Mental and Behavioural Conditions, 2022.

Question 21 (12 marks)

You are caring for an adult patient with respiratory distress.

Part a (2 marks)

Define the two (2) types of respiratory failure.

Model answer

- Type I: Hypoxaemic respiratory failure. Main issue is oxygenation
- Type II: Hypercarbic respiratory failure. Main issue is ventilation

Part b (2 marks)

In addition to treating the underlying cause, state the two (2) strategies that can be used to correct type I respiratory failure

Model answer

1. Increase FiO_2
2. Increase PEEP/EPAP

Better answer is if candidates stated why

Part c (2 marks)

In addition to treating the underlying cause, state the two (2) strategies that can be used to correct type II respiratory failure

Model answer

- Increase RR
- Increase TV
- Increase delta pressure between IPAP and EPAP/PEEP
- Decrease FIO_2 if chronic retention (Need to give this info to score)

Part d (2 marks)

In the ED state two (2) non-invasive modalities/strategies that can be used to address type I respiratory failure

Model answer

- High Flow Nasal cannulae
- CPAP (or other NIV modality but cannot score > 1 mark for both CPAP and BiPAP)
- Increase oxygen delivery through conventional means- Increase flow rate, Venturi system, Non-rebreather mask
- BVM assisted ventilation (with PEEP)

Part e (2 marks)

State two (2) non-invasive modalities/strategies that can be used to address type II respiratory failure

Model answer

- BiPAP- Bilevel positive airway pressure
- AVAPS- Average volume assured pressure support
- Decrease FiO₂ with sats aimed at 88-92%
- BVM with inc RR

NB Zero score rule if give high FiO₂ as can be dangerous in CO₂ retainers.

Part f (2 marks)

After commencing your treatment in a patient with type II respiratory failure, their respiratory rate has decreased. In addition to blood gas analysis, state two (2) ways in which you would determine that their respiratory status is improving

Model answer

- Improved mental state
- Decreased drowsiness
- Tidal volume >8-10 ml/kg
- Decreased work of breathing
- Improved AE

Question 22 (12 marks)

Storm season is approaching and you are reviewing the ED's approach to the management of lightning-related injuries.

Part a (4 marks)

Excluding cardiac arrest, list four (4) symptoms or clinical features that can occur immediately with lightning injury

Model answer

- Chest pain
- Muscle aches
- Neurological deficits – can have immediate LOC and then when regaining consciousness, may be mute and unable to move. Often transient for minutes only. Can take up to 24hrs
- Confusion/amnesia/headache/paraesthesias
- Tinnitus
- Contusions from shock waves
- TM rupture
- Eye injuries (e.g hyphaema/IO haemorrhage/corneal burns etc etc)
- Associated traumatic injury

Others may be acceptable

Part b (6 marks)

List six (6) delayed clinical features that can occur with lightning injury

Model answer

- Keraunoparalysis
- Lichtenberg figures
- Cataracts
- Myoglobinuria/haemoglobinuria (→ AKI)
- Sensorineural hearing loss
- Vestibular dysfunction
- Retinal detachment
- Optic nerve damage
- High rate of foetal death In utero in pregnant patients, despite maternal survival

Part c (2 marks)

What is the most common and second most common cardiac rhythms in lightning-induced cardiac arrest?

Model answer

Most common: Asystole

Second most common: VF

Question 23 (12 marks)

A 27 year old male presents to your emergency department with a headache, myalgias, fever and night sweats. He returned from Sri Lanka 8 days ago.

His Vitals are:

HR	110 bpm
BP	108/62 mmHg
Temp	38.8 °C
RR	22 /min
Sats	97 % RA

Part a (8 marks)

List four (4) differential diagnoses and for each give a corresponding diagnostic investigation.

Model answer

- Typhoid – blood culture
- Malaria – thick and thin films
- Dengue – dengue serology
- Influenza – viral PCR
- Covid – Covid PCR
- Chikungunya – ELISA
- HIV – HIV serology
- Leptospirosis – blood culture/ELISA

Part b (4 marks)

List four (4) key features you would seek on clinical history from the patient

Model answer

- Length of stay
- Other countries travelled in
- Contact with animals
- Sexual activity (particularly sex workers)
- Areas travelled (into the jungle ect vs City only)
- Malaria prophylaxis
- Exposures – food and water sources
- Pretravel vaccinations
- Timing and pattern of fever
- Accommodation

Question 24 (12 marks)

You are an ED consultant working in a metropolitan adult ED on the first Sunday morning of a new clinical year.

An 84 yo female brought in following a fall at home is being assessed by a new ED registrar working their second shift in your ED. This is the first and only patient the registrar has seen this shift.

The nurse caring for the patient advises you they are concerned about the registrar's behaviour.

She states the registrar is being argumentative with staff, rude to the patient, is slurring his words, and smells of beer.

Part a (3 marks)

List three (3) possible causes of the doctor's behaviour

Model answer

1. Alcohol effects (including hangover)
2. Drug use (including come-down)
3. Mental illness, psychosocial stress
4. Other impairment – medical condition eg hypoglycaemia

Part b (5 marks)

Describe five (5) immediate actions you would take.

Model answer

- I. Patient safety – assign another doctor to care for patient
- II. Take registrar off duty – personal/sick leave
- III. Arrange for safe transport home
- IV. Arrange appropriate medical follow up & professional support (eg VDHP)
- V. Notify ED Director/Medical Services
- VI. Consider need for open disclosure with patient/family
- VII. Document carefully / incident report
- VIII. Arrange support for nurse

Part c (4 marks)

List four (4) circumstances where you are required to make a mandatory notification to the Medical Board (Australia) or Medical Council (Aotearoa/New Zealand)

Model answer

- Intoxication while practising
- Impairment
- Sexual misconduct
- Significant departure from accepted professional practice

Question 25 (12 marks)

A woman is involved in a high speed motor vehicle crash and is brought to your ED. She is 34 weeks pregnant.

Part a (12 marks)

List six (6) important anatomical or physiological changes that occur in pregnancy that will influence your resuscitation of this patient. For each one, state how you will modify your management

Model answer

		Anatomical or physiological change (4 marks)	Management (8 marks)
Airway	1	Congested airway mucosa/smaller diameter	Smaller ETT
	2	Large breasts	Short laryngoscope handle and/or ramping pillow
Breathing	3	Relaxed oesoph sphincter	Early NGT to drain stomach
	4	Elevated diaphragm	Insert ICC 1-2 spaces higher
Circulation	5	IVC compressed by uterus	Left lateral tilt or manual displacement of uterus
	6	Placental vessels sensitive to vasopressors	Avoid vasopressors

Other possible:

Increased oxygen demand/reduced oxygen reserve – early supplemental oxygen, anticipate rapid desat during intubation

Increased blood volume

Increased HR/low BP – can mask blood loss

Large uterine blood volume – significant risk massive blood loss from uterine injury

Question 26 (12 marks)

A 55 year old man with history of hypertension, last seen 12 hours ago, has been found with a right sided hemiparesis and aphasic. On arrival to your Emergency Department, his BP is 80/50 mmHg and oxygen saturation 85% RA;

Part a (2 marks)

List two (2) clinically significant findings on his ECG shown below.



Model answer

Must address

1. Bi-fascicular block
2. Septal infarct

Part b (1 marks)

List your most likely diagnosis.

Model answer

TAD with Cx/shock either cardiogenic or obstructive.

Part c (4 marks)

You decide to utilise point of care ultrasound in his management; you are aware that Rapid Ultrasound in Shock (RUSH) Exam is shown to have a high sensitivity (87%) and specificity (89%).

Showing your formula, calculate Positive and Negative likelihood ration (LR) for RUSH study.

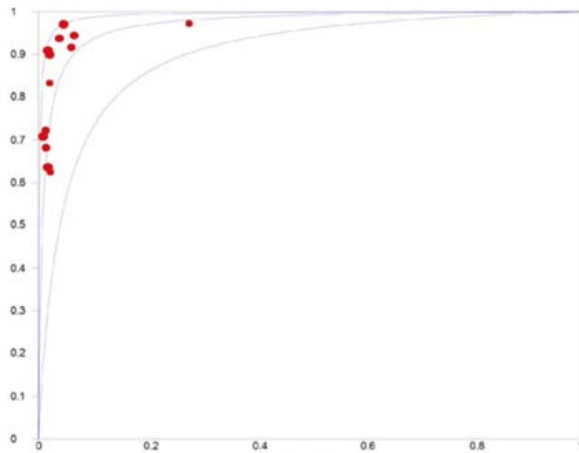
Model answer

+LR 7.91 ($S_n/1-S_p$)

-LR 0.15 ($1-S_n/S_p$)

Part d (2 marks)

The following graph demonstrates the Receiver Operating characteristic (ROC) curve for RUSH exam, showing the Area under the curve (AUC) of 0.9699.



State the definition of 'Area under the Curve' and your interpretation of the mentioned AUC for RUSH exam.

Model answer

mark for addressing the concept; either of:

The area under (a ROC) curve is a measure of the accuracy of a quantitative diagnostic test.

Or

An ROC curve (receiver operating characteristic curve) is a graph showing the performance of a classification model at all classification thresholds. This curve plots two parameters: True Positive Rate. False Positive Rate

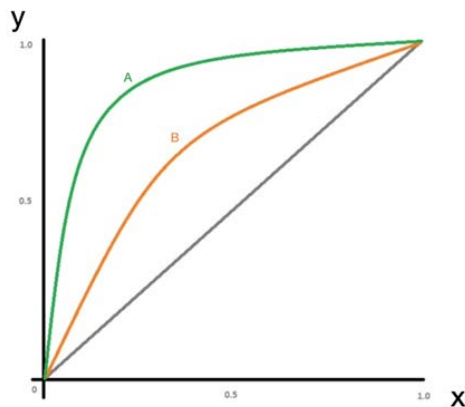
Or

AUC - ROC curve is a performance measurement for the classification problems at various threshold settings. ROC is a probability curve and AUC represents the degree or measure of separability. It tells how much the model is capable of distinguishing between classes.

AUC represents the probability that a random positive (green) example is positioned to the right of a random negative (red) example. AUC ranges in value from 0 to 1. A model whose predictions are 100% wrong has an AUC of 0.0; one whose predictions are 100% correct has an AUC of 1.0

Part e (3 marks)

On the following graph, considering the above discussion, what do the 'y' and 'x' axes represent? And state which graph does represent a more accurate test and why?



Model answer

mark for addressing the concept; either of:

Y = Sensitivity (TP rate)

X = 1-Specificity (FP rate)

The average value of sensitivity for all possible values of specificity (Zhou, Obuchowski, McClish, 2001).

The average value of specificity for all possible values of sensitivity (Zhou, Obuchowski, McClish, 2001).

The probability that a randomly selected subject with the condition has a test result indicating greater suspicion than that of a randomly chosen subject without the condition (Hanley & McNeil, 1982).

The **receiver operating characteristic (ROC) curve** is a statistical relationship used frequently in radiology, particularly with regards to limits of detection and screening.

The curves on the graph demonstrate the inherent trade-off between sensitivity and specificity:

y-axis: sensitivity

x-axis: 1-specificity (false positive rate)

A perfect test would be perfectly sensitive and have no false positives (100% specific). This curve would go through the point at the very top left corner (Figure 1).

A worthless diagnostic test would be no better than chance (a straight line through the origin).

One can generate an ROC curve between these two extremes by determining the cut-off points for sensitivity and specificity given the modality, disease, and patient population in question (Figure 2).

The curve can also be used to find the point at which the trade-off between sensitivity and specificity is optimal (i.e. the apex of the curve).

Area under the curve (AUC)

Determining the area under the curve (AUC), allows one to compare different tests. The greater the area under the curve (up to the maximum 1.0), the more accurate the test is (both better sensitivity and specificity).

An inexact guide to AUC values 3, modelled on the traditional academic points system 4, is given below:

0.90-1.00: excellent accuracy

0.80-0.90: good accuracy

0.70-0.80: fair accuracy

0.60-0.70: poor accuracy

0.50: no discriminating ability

Question 27 (18 marks)

A 79 year old male patient presents to your Emergency Department. with acute vertigo.

Part a (6 marks)

List three (3) peripheral and three (3) central causes of vertigo that you would consider

Model answer

Peripheral:

- Benign paroxysmal positional vertigo
- Vestibular neuritis
- Labyrinthitis
- Meniere's disease
- Perilymph fistula
- Superior canal dehiscence
- Vestibular schwannoma

Central cause:

- Vestibular migraine
- Cerebellar/brainstem stroke
- Posterior circulation TIA
- Cerebellar haemorrhage
- Medications (a wide range)
- Anticonvulsants (e.g., phenytoin, carbamazepine, pregabalin)
- Antihypertensives and drugs with hypotension as side effects
- Adrenergic blockers (e.g., propranolol, terazosin)
- Diuretics (e.g., furosemide)
- Vasodilators (e.g., isosorbide)
- Tricyclic antidepressants (e.g., amitriptyline, nortriptyline)
- Phenothiazines (e.g., chlorpromazine)
- Ototoxic drugs and vestibular suppressants
- Aminoglycosides (e.g., gentamicin)
- Anticholinergics (e.g., transdermal scopolamine, promethazine, amitriptyline, meclizine)
- Loop diuretics (furosemide)
- cis-platinum
- Psychotropic agents
- Sedatives (e.g., barbiturates and benzodiazepines)
- Drugs with Parkinsonism as side effects (e.g., phenothiazines)
- Drugs with anticholinergic side effects (e.g., amitriptyline)
- Miscellaneous drugs
- Amiodarone (mainly used for atrial fibrillation)
- Flecainide

Part b (2 marks)

Complete the following table by providing two (2) clinical findings that would help differentiate between a central and a peripheral cause for vertigo

Model answer

Clinical Findings	Central	Peripheral
Vertigo when still	Yes	No
Able to stand unaided	May be able to	Yes
Spontaneous and evoked nystagmus	Yes	No
Worse when moves head	Yes	Yes
Other neurological symptoms	Yes, but not often	No
New hearing loss	Can occur	No

Part c (1 marks)

What physical examination finding should a patient have before you consider a HiNTs exam?

Model answer

Nystagmus at rest

Part d (6 marks)

Complete the table by listing the expected findings in a HiNTs exam

Model answer

Name of test	HINTS-central	HINTS-peripheral
Head Impulse Test	Normal	Abnormal
Nystagmus	Bidirectional	None/unidirectional
Test of Skew	Vertical	NO vertical skew

Part e (3 marks)

Name three (3) categories of drugs with an example of each, that may help in the treatment of BPPV

Model answer

- Anticholinergic Scopolamine
- Antihistamine Promethazine
- Antiemetic ondansetron
- Benzodiazepines Diazepam
- Corticosteroids Prednisolone
- Vasodilators Betahistadine
- Calcium antagonist Nimodipine
- Antiviral Valacyclovir
- Anticonvulsants Valproate
- B-Blockers Metoprolol

Other examples of actual drug are acceptable