

Candidate number \_\_\_\_\_

# **BOOK ONE**

QUESTION 1 (20 marks) – DOUBLE QUESTION

A 65 year old man has presented to your regional ED with acute onset SOB and chest pain. His pain is severe and radiates to his back.

Vital signs:	HR	125 bpm
	BP	98/52 mmHg
	RR	22 bpm
	SaO2 RA	96%
	Temp	37.2 deg C

- i. List 4 important features on this ECG (4 marks)

**A 12 LEAD ECG IS SHOWN IN THE PROPS BOOKLET, PAGE 3**

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- Inferior STEMI
  - STE lead III
  - Hyperacute T wave leads II, III, aVF
  - Reciprocal changes aVL STD and TWI
- Possible RVTMI
  - III>II
  - V2 ST depression

- ii. List 4 features on a CXR that would raise your suspicion of acute aortic dissection (4 marks)

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- Widening of the superior mediastinum
- Dilatation of the aortic arch
- Change in the configuration of the aorta on successive CXR
- Obliteration of aortic knob
- Double density of aorta (suggesting true and false lumen)
- Localised prominence along aortic contour
- Disparity of calibre between descending and ascending aorta
- “Calcium Sign” (>6mm between intimal calcium and shadow of outer aortic wall)
- Displacement of trachea to right
- Distortion of left main stem bronchus
- Pleural effusion
- Cardiomegaly

iii. What features on bedside US would help differentiate acute MI from aortic dissection as the cause of shock (4 marks)

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- Myocardial infarction (inferior/right ventricle)
  - Regional wall motion abnormality/hypokinesis
- Dissection
  - Pericardial effusion + right vent collapse + dilated IVC (Pericardial tamponade)
  - AV incompetence/regurg
  - Intimal flap (sternal notch view)

iv. CT imaging is unavailable. Given the patient's history and clinical examination you treat him for an acute aortic dissection. List 6 management steps (6 marks)

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- Manage in resuscitation bay
- x2 IVC access; bloods including group and hold
- IV analgesia (opiate: fentanyl/morphine)
- IV rate control (beta-blocker: metoprolol, esmolol); aim for rate 60
- IV BP control (GTN, SNIP, hydralazine); aim for SBP <140
- Arterial line for invasive BP monitoring
- Urgent transfer to CTSx centre for CT +/- OT

v. List a classification of aortic dissections (2 marks)

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- Stanford
  - A: Ascending aorta with or without descending
  - B: Descending aorta only (distal to origin of left subclavian)
- De Bakey
  - I Ascending and descending
  - II Ascending only
  - III Descending only
    - A: thoracic
    - B: extends into abdominal aorta

QUESTION 2 (10 marks)

A 40 year old woman presents with symptoms of a common peroneal nerve injury of her left leg following an ankle sprain.

- i. Describe the sensory and motor disturbance features of a common peroneal nerve injury (4 marks)

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- Sensory deficit
  - lateral leg below knee
  - dorsum foot
- Motor deficit
  - dorsiflexion ankle (foot drop) and great toe
  - eversion foot

- ii. Where is the commonest site of injury (1 mark)

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- At the fibular head

- iii. List 4 general causes of common peroneal nerve injury other than high ankle sprain (4 marks)

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- Fracture fibula
- Tight plaster leg involving knee
- Regular wear of high knee boots
- Prolonged coma or bed rest with pressure at knee
- Pneumatic compression
- Habitual leg crossing
- Total knee arthroplasty
- Proximal tibial osteotomy
- Leg squatting/crossing
- Endocrine/metabolic disorders: diabetes, alcoholism, thyrotoxicosis, vitamin B depletion
- Others...

iv. How is this peripheral nerve lesion differentiated from an L5 radiculopathy (1 mark)

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- Inversion and plantar flexion should be preserved
  - Decreased or absent ankle reflex in radiculopathy

QUESTION 3 (17 marks)

A 27 year old male driver has been involved in a motor vehicle crash at 140kph. He was taken to a rural base hospital and was intubated soon after arrival in ED. Current vital signs are BP 80/40 mmHg, P 140 bpm.

**A CHEST XRAY IS SHOWN IN THE PROPS BOOKLET, PAGE 4**

i. List 6 findings on his CXR (6 marks)

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- ETT just above the level of his clavicles
- NG tube in situ that migrates below the level of the right hemidiaphragm and curls around to the left above the level of the right hemidiaphragm
- Deviation of the NG tube to the right
- Elevation of the left hemidiaphragm
- Fracture left scapula(subtle)
- Left lung basal collapse/consolidation
- Left apical capping
- Widened mediastinum

ii. List 5 potential diagnoses in order of severity (5 marks)

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- Aortic dissection/transection
- Diaphragm rupture
- Cardiac injury(blunt)
- Lung injury-contusion/laceration
- Spleen injury
- Fractures- scapula, ribs

iii. List the next 3 investigations you would order/perform, in order of priority and provide your reasoning (6 marks)

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- EFAST
  - assess for pericardial tamponade, assess for Type A dissection and assess for abdominal FF/PTx/HTx
- Bloods
  - FBC, G+H, coag - suspected haemorrhage and coagulopathy of trauma
- CT pan scan
  - given mechanism to assess for aortic injury, significant solid organ injury/abdominopelvic bleeding
- Blood gas
  - assess for shock - BE, lactate and response to Rx



QUESTION 4 (11 marks)

There have been a number of incidents in your emergency department Short Stay Unit where patients have unexpectedly deteriorated during their stay.

i. Define the role of a Short Stay Unit (2 marks)

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- To manage Emergency Medicine patients who would benefit from extended treatment and observation but have an expected length of stay of less than 24 hours.
- Taken from Cameron Textbook of Adult Emergency Medicine 3rd Edition Section 27.2
- 1 mark for providing extended care for Emergency Medicine patients
- 1 mark for acknowledging an expected length of stay of 24 hour or less

ii. How would you develop a solution to this problem (4 marks)

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- Gather information
- Develop solution plan
- Implement plan
- Audit / Re-collect data
  
- Note exact wording not essential but plan must include aspects of each of these domains to score maximum marks

iii. You are tasked to develop exclusion criteria for your Short Stay Unit. List 5 criteria (5 marks)

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- Patients who should be admitted to in-patient wards - complex medical or surgical problems
- Multiple problems
- Elderly patient
- Paediatric patients
- Patients without clear management plan / diagnosis
- Patients with intensive nursing requirements
- Risk to staff patients - psychotic, violent, forensic history

Taken from Cameron Textbook of Adult Emergency Medicine 3rd Edition Section 26.6

QUESTION 5 (19 marks)

A 28 year old male with a known history of ice abuse has been brought into your tertiary ED by ambulance having required pre-hospital sedation with intramuscular droperidol.

Vital signs are:

T	38.4 deg C
HR	128 bpm
BP	158/80 mmHg
RR	18 bpm
SaO2	100% on 6L via HM
GCS	9 (E2V2M5)

i. Describe 5 possible causes of his presentation (5 marks)

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- Drug ingestion/withdrawal (serotonin or NM syndrome less likely) – sympathomimetics, anticholinergics, aspirin etc
- Meningo-encephalitis
- Post-ictal
- Dyselectrolytaemia
- Heat illness
- Subarachnoid haemorrhage
- Traumatic ICH

ii. List 5 investigations you would perform and provide your reasoning (5 marks)

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- Glucose – hypo/hyperglycaemia rapidly reversible
- A/VBG – occult sepsis, hypercarbia, glucose, electrolytes
- CTB – SAH/ICH/CVA (SOL)
- Electrolyte panel (biochemistry ALF/ARF)
- Blood ETOH/measured-calculated osmolarity
- ECG – QT prolongation post droperidol
- Consider LP after CTB – for infection/xanthochromia
- Must provide an answer with reasoning to score one mark

iii. The patient promptly suffers a grand mal seizure. Describe your initial management, including drug doses where appropriate (5 marks)

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- Midazolam 0.15mg/kg (possibly in two divided doses) +/- phenytoin/keppra (15-20mg/kg)
- Manage airway, assess need for ETT and GA
- Early antibiotics +/- anti-virals

iv. His Na<sup>+</sup> level is 116 mmol/L. Outline the initial management of his hyponatraemia and plan for the next 24 hours (4 marks)

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- Bolus 100 mls 3% HTS, repeat x 1 if remains altered mental state with airway threat, further seizure (and Na<sup>+</sup> not climbed over 6mmol/L)
- Aim total Na<sup>+</sup> increase 6-12 mmol/24 hours (0.5-1.0 mmol/L/hr including bolus Rx); or calculate deficit and aim to replace half the deficit in appropriate timeframe
- Will require HDU/ICU management

QUESTION 6 (17 marks)

i. List 3 key ECG features of significant HYPOkalaemia (3 marks)

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- QTc prolongation
- Prominent U wave
- T wave flattening

Others (of equal value): PR prolongation, increased P wave amplitude and width, ST depression, *torsades de pointes*, atrial ectopics, ventricular ectopics, atrial tachyarrhythmias (fibrillation, flutter). NB: "arrhythmia" without qualification does not count.

ii. List 3 key ECG features of significant HYPERkalaemia (3 marks)

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- Tall, tented T waves
- Prolonged or widened QRS
- Flattened, or loss of P waves
- Others (of equal value): Prolonged PR interval, sine wave pattern, bundle branch blocks, VF, asystole. NB: "arrhythmia" without qualification does not count.

- iii. List 3 treatment options for acute severe hyperkalaemia. For each, describe its mechanism of action and time course (9 marks)

Treatment/Dose	Mechanism of Action	Onset & duration of effect
Calcium gluconate or chloride 10% 10-30 mL	Stabilize cardiac cell membrane	Onset 1-5 min; duration 30 min
Nebulized salbutamol 5-10mg	Drive K into cells	Onset 30 min; duration 2 hours
Insulin 10-20 units + Glucose 50% 25-50 mL	Insulin drives K into cells; glucose prevents hypoglycaemia	Onset 15-30 min; duration 2-6 hours
NaHCO <sub>3</sub> 8.4% 50-100 mL	In acidotic patient drives K into cells	Onset 30-60 min; duration - hours

- iv. Briefly outline any concerns or issues related to using cation-exchange resins (calcium resonium) for the acute treatment of hyperkalaemia (2 marks)

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- Very slow onset/delay to effect (at least 4-10 hours...up to days)
- Variable effect on lowering K (probably lowers it a bit after many hours)
- Frequent constipation
- Rare colonic necrosis → perforation

## QUESTION 7 (16 marks)

A 32 year old man is brought to your ED by ambulance with acute confusion, recent tiredness, 10 kg weight loss and heat intolerance. He appears to have bulging eyes. Vital signs are:

HR 146 bpm  
BP 180/110 mmHg  
RR 40 bpm  
SaO<sub>2</sub> 100 % RA  
GCS 13  
Temp 38.5 deg C

- i. State the most likely diagnosis and give 4 differential diagnoses for this presentation (5 marks)

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- Thyroid storm
- Meningoencephalitis
- Sepsis – any source
- Toxidromes (anticholinergic/sympathomimetic/serotonin syndrome/NMS)
- Salicylate poisoning
- Withdrawal of EtOH– DT's
- Withdrawal of BDZ/opiates
- Heat stroke
- Hypothalamic stroke

ii. Provide details of 3 specific pharmacological treatments for this condition and the role of each treatment (6 marks)

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- Beta blockers – eg Propranolol 1mg IV q 5mins up to 10mg, then 40 – 120mg q 6h regularly: block peripheral effects & inhibits peripheral conversion T4 to T3, aim pulse <100
- PTU: 900 – 1200mg loading (PO/NG) then 200mg q4-6h: blocks de novo synthesis (or Carbimazole)
- Iodine – Lugols iodine 8 -10 drops PO q 6h (or Na Iodine 1g IV bd): Prevents release stored hormones (NB must wait approx. 4 hours after PTU to ensure synthetic pathway blocked (or lithium carbonate if allergic to iodine)
- Steroids – hydrocortisone 100mg q6h: tx steroid concomitant deficiency & inhibits peripheral conversion T4 to active T3

iii. List 5 other management and disposition priorities (5 marks)

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- Cooling eg cooling blankets, cold fluids, antipyretics
- Fluid resuscitation /ABCs
- Seek and treat complications eg CV collapse
- Seek and treat precipitants eg ECG for ACS, Abx for sepsis
- Cultures/IV antibiotics if indicated
- Urgent Endocrine review /admission
- HDU review



**QUESTION 8 (16 marks)**

A 32 year old man presents to your Emergency Department with a history of fever, lethargy and severe pain in his right groin and thigh. He has a history of intravenous drug use but is otherwise well and on no medications. On examination his right thigh is diffusely swollen, erythematous and has palpable crepitus.

His vital signs are:      HR 120 bpm  
                                    BP 85/40 mmHg  
                                    T 40 deg C  
                                    RR 20 bpm  
                                    SaO2 99% RA

i. What is your working diagnosis (3 marks)

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- Septic shock
- Likely focus of infection – skin infection of the groin
- Additional marks: necrotising fasciitis, infection likely due to direct injection to groin from IVDU

ii. Outline your key management steps (6 marks)

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- **Resuscitation:**
  - Continuous cardiorespiratory monitoring
  - Large bore IV access and IVF resuscitation
    - Take off baseline bloods including blood cultures
    - 1000ml crystalloid stat (N/S)
    - Titrate to response – vitals/UO/lactate
  - Inotropes
    - Consider if no response , after 3L IVF resuscitation

- Noradrenaline (dose)
- **Early empirical IV antibiotics**
  - Meropenem 1g q8hourly
  - Vancomycin 1g BD
  - Clindamycin 600mg q8hourly  
(Reference: eTG)
- **Analgesia**
- **Early surgical referral for debridement** (to remove devitalised tissue) a cornerstone of treatment
- Consider Hyperbaric oxygen treatment
- D&A input
- Imaging – CT leg/abdo to determine extent

iii. List 3 likely microorganisms to have caused this patient's infection (3 marks)

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- Staphylococcus aureus (esp IVDU)
- Streptococci (esp Group A BH Strep – S.pyogenes)
- Clostridium (C. perfringens)
- Others ( E.coli, anaerobes eg bacteroides, vibrio if water involved)

iv. The nurse reports this patient is extremely distressed with pain and is crying out for larger doses of analgesia and his methadone. List some principles of pain management in this patient with narcotic addiction (4 marks)

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- Genuinely painful pathology, so do not withhold pain relief for fear of “drug seeking”, give adequate analgesia
- Will have increased tolerance for narcotics, so will likely need larger and more frequent doses
- Open discussion with patient
- Analgesia ladder – don't forget paracetamol, NSAIDs, mechanical principles (rest, elevation, keep sheets off area etc)
- Get specialised input: D&A, methadone provider, Anaesthetics/Pain team
- At risk of narcotic withdrawal - discuss with nursing staff, commence withdrawal chart
- Document plan carefully

QUESTION 9 (18 marks)

A 4 year old previously well girl, presents with a sudden onset generalised tonic-clonic seizure lasting 40 minutes, terminated with one dose of midazolam. Immediately afterwards she is GCS 3, and apnoeic.

- i. Briefly describe two methods for maintaining ventilation in this situation and the reason for your preferred method (4 marks)

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- Bag valve mask
- +/- airway adjunct
- LMA
- Intubation and ventilation
- BVM preferred method because least invasive and patient likely to recover once post ictal phase and midazolam has worn off and high CO<sub>2</sub> washed out
- LMA second line if BVM +AA fails
- I and V if vomiting, potential aspiration

- ii. List 5 possible causes of apnoea in this situation (5 marks)

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- Post ictal phase
- Midazolam
- Hypercapnoea (respiratory acidosis) from hypoventilation
- Hypoglycaemia
- Ongoing subclinical seizure
- Coning due to space occupying lesions

- ICH/SDH/SAH (can count separately)
- Tumour/abscess
- Coning due to cerebral oedema
- Electrolyte abnormalities
- Meningitis (unlikely as the child was well)
- Paralysis due electrolyte abnormalities (eg familial hypokalaemic paralysis)
- Cord injury during handling or seizure

The child improves to a GCS of 14 in 30 minutes. There are no focal neurological signs and no preceding illness or fever apart from the occasional headache. The child was born in Australia but spent 3 months in India returning 6 months ago. Her glucose and electrolytes are normal.

iii. List 5 possible causes for the seizure (5 marks)

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- 1 mark per answer and extra mark if they mention neurocysticercosis or parasitic brain infestation
- Otherwise many causes

iv. Outline the Pros and cons of CT vs MRI of brain in this situation (4 marks)

	PRO	CON
MRI		
CT		

- MRI
  - PRO
    - Better pictures, better diagnostics, no radiation
  - CONS
    - Availability may make it too slow if there is a time critical problem going on. More likely to need a GA or sedation to keep still
    - Claustrophobia
    - Difficult to monitor pt in tunnel
    - Expensive
- CT
  - PRO
    - Quick and available in most departments.
    - Modern rapid scanners rarely need GA or sedation in children of this age
    - Good diagnostics esp for fractures and bleeds
  - CON
    - Not as good as MRI for soft tissue lesions/masses
    - Radiation cancer risk (?1:1000)