

Northern Sydney Hospitals/NSW HETI Network 2

# **FELLOWSHIP EXAMINATION PRACTICE PAPER**

2016.1

## **Short Answer Questions**

Candidate directions:

1. This is a 3 hour examination
2. There are 3 separate books of 9 questions each. Each book should be completed in 1 hour.
3. Props (images, ECGs) are reproduced in the accompanying props book
4. The first question in each book is a double question. Otherwise questions are of similar value
5. Answer each question in the space provided on the examination paper.
6. Write your name on each page

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# **BOOK ONE**

## QUESTION 1 (25 marks) – DOUBLE QUESTION

A 42 year old man is brought by ambulance after completing a long distance bicycle race. Since the race his wife reports he has been acting strangely and fainted twice. She was told by his fellow cyclists that he had drunk plenty of water and had not fallen off his bike.

His vital signs are:

Temp: 39.5 degrees (per rectal)

HR: 122 regular

BP: 100/45

GCS: 14

- i. List 5 potential causes for this man's symptoms and signs (5 marks)

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- ii. List 5 investigations that you think are the most important and their rationale (10 marks)

| INVESTIGATION | RATIONALE |
|---------------|-----------|
|               |           |
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|               |           |
|               |           |

- iii. The patient's temperature rises to 41 degrees (per rectal). Outline 4 actions in your initial management (4 marks)

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- iv. Despite resuscitative efforts the patient's temperature rises to 42 degrees and he has a generalised seizure. Outline 6 treatment priorities now. Provide doses and end points where appropriate (6 marks)

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QUESTION 2 (11 marks)

A 51 year old lady presented having been seen in your ED 3 days ago after an MVA. A senior registrar reviewed her and a full trauma assessment was performed. No major injuries were found. She complained of foot pain prior to discharge and an x-ray was performed. The discharge letter states no fracture, and she was advised to treat this as a sprain. She represents with ongoing pain and is now unable to weight bear.

**AN XRAY OF THE FOOT IS SHOWN IN THE PROPS BOOKLET, PAGE 3**

- i. Describe the main abnormality in this x-ray and the likely diagnosis (2 marks)

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- ii. List 3 fractures which can occur in association with this injury (3 marks)

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- iii. The patient is angry about the missed injury and states she is going to make a complaint. Briefly outline how you would address this complaint (6 marks)

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QUESTION 3 (16 marks)

A 26 year old man presents with a 3 day history of sharp central chest pain suggestive of pericarditis. His observations are stable apart from a temp of 38C.

**THE ECG IS SHOWN IN THE PROPS BOOKLET, PAGE 4**

- i. List the ECG abnormalities (3 marks)

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- ii. What ECG features would make a diagnosis of benign early repolarisation more likely? (2 marks)

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- iii. List 5 causes of pericarditis (5 marks)

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- iv. List 3 investigations used to detect a pericardial effusion in this setting – include a brief description of the positive finding for each investigation (6 marks)

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QUESTION 4 (13 marks)

You are at a peripheral hospital with no maternity facilities when a 16 year old obese girl presents in the second stage of labour. Up until this presentation she was unaware that she was pregnant.

- i. List 5 steps you would take to prepare for her delivery (5 marks)

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Within minutes of arrival the baby's head is delivered. However on the next contraction you are unable to deliver the shoulders despite gentle axial traction.

- ii. Name this condition and in what period of time should the baby be delivered to avoid serious foetal hypoxia (2 marks)

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iii. Describe 3 manoeuvres that may enable the safe delivery of the child (6 marks)

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QUESTION 5 (21 marks)

A concerned first-time mother has brought her 2-week-old baby to the ED because the baby is jaundiced.

- i. What is the name of the pathological condition caused by neonatal jaundice? (1 mark)

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- ii. If left untreated, what are 2 sequelae of this condition? (2 marks)

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- iii. List 2 benign causes of neonatal jaundice (2 marks)

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- iv. List 4 pathological causes of neonatal jaundice (4 marks)

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v. What 5 historical features will guide your assessment of this child? (5 marks)

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vi. How can a serum bilirubin assist your assessment? (2 marks)

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vii. List 5 other investigations you might consider (5 marks)

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QUESTION 6 (15 marks)

A 65 year old woman presents to ED with lower back pain and normal observations. She has a history of type 2 diabetes but is otherwise well. There is no history of trauma.

i) List 6 historical features which may suggest serious pathology (6 marks)

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ii) After taking your history you are concerned about possible cauda equina syndrome. List 4 examination findings which would support your diagnosis (4 marks)

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iii) List the most important immediate investigation and the most important treatment if this condition is confirmed (2 marks)

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iv) List the most common cause, and 2 other causes for cauda equina syndrome (3 marks)

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## QUESTION 7 (15 marks)

A 62 year old male is brought to ED by ambulance after falling 4 metres from a ladder, sustaining a head injury. Primary survey is unremarkable apart from a significant head injury. There is an obvious swelling to the left side of his face and it is difficult to open his left eye.

Observations are:

HR 100, BP 100/60, SaO<sub>2</sub> 99% RA, RR 16, GCS 6

- i. You elect to undertake an RSI to secure his airway prior to imaging. Complete the tables below:
  - a) List 2 possible sedative drugs and doses you could use to facilitate RSI (4 marks)
  - b) List one potential positive and one potential negative aspect of each drug's pharmacodynamics in this patient (4 marks)

|  |  |  |
|--|--|--|
| Drug   |  |  |
| Dose   |  |  |
| Positive pharmacodynamics specific to head injured patient |  |  |
| Negative pharmacodynamics specific to head injured patient |  |  |

- ii. List 4 positive findings from the 2 axial CT images (4 marks)

**2 AXIAL IMAGES OF A CT BRAIN ARE SHOWN IN THE PROPS BOOKLET, PAGE 5 & 6**

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- iii. Neurosurgery review the patient and are keen to take the patient to theatre urgently. A lateral canthotomy is also suggested. List 3 signs in an unconscious patient that would suggest a need for urgent lateral canthotomy (3 marks)

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QUESTION 8 (15 marks)

You have agreed to be the expedition doctor for a trek to the Everest base camp. (altitude 5300m)

- i. Outline the proposed pathophysiology of:

Acute Mountain Sickness (AMS)/High Altitude Cerebral Oedema (2 marks)

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High Altitude Pulmonary Oedema (2 marks)

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- ii. List 2 risk factors for the development of High Altitude Pulmonary Oedema at any given altitude (2 marks)

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- iii. List 5 clinical features of AMS (5 marks)

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- iv. For severe High Altitude Pulmonary Oedema, list 4 treatment options (4 marks)

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QUESTION 9 (18 marks)

You are on duty in a small urban district hospital. You attend to an 8 year-old boy who was rescued from the bottom of a saltwater backyard pool, unconscious. He was resuscitated by pre-hospital personnel and presents with the following vital signs:

HR 72 bpm, regular

BP 90/60 mmHg

RR 24 bpm

SaO<sub>2</sub> 100 % on high flow oxygen

- i. Outline 5 key features in your examination of this child (5 marks)

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- ii. List 5 factors which determine this child's prognosis (5 marks)

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- iii. The child’s GCS improves to 14. Despite high flow “non-rebreather” mask oxygen, he shows signs of respiratory distress from aspiration pneumonitis. Complete the table outlining 3 escalating modalities that could be used to improve his oxygenation. Describe initial settings and sizes as appropriate (6 marks)

| Treatment/modality | Settings |
|--------------------|----------|
|                    |          |
|                    |          |
|                    |          |

- iv. List 4 potential disadvantages of the use of non-invasive mask ventilation (CPAP or BiPAP) for this child in the aero-medical retrieval context (4 marks)

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# BOOK TWO

## QUESTION 10 (24 marks) – DOUBLE QUESTION

Ambulance officers are bringing a 5-month old baby to your ED, in cardiac arrest. You have a few minutes to prepare your drugs and equipment.

- i. Complete the table below (10 marks)

|                  | Formula/calculation | Answer |
|------------------|---------------------|--------|
| Estimated weight |                     |        |
| ETT size         |                     |        |
| DC shock joules  |                     |        |
| Adrenaline dose  |                     |        |
| 10% glucose dose |                     |        |

- ii. Complete the table below identifying the recommended compression:ventilation ratio for each group (3 marks)

| Group      | Ratio |
|------------|-------|
| Neonatal   |       |
| Paediatric |       |
| Adult      |       |

- iii. Briefly explain the rationale for different compression ratios in these populations (2 marks)

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- iv. Briefly explain why the ratio recommended for lay provider BLS is constant across age groups (1 mark)

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- v. The child regains spontaneous circulation but is agitated and requires a rapid sequence induction. Please list the drugs you will choose, including doses (6 marks)

| Drug | Dose/kg | Dose |
|------|---------|------|
|      |         |      |
|      |         |      |

- vi. Increasingly cuffed endotracheal tubes are used in paediatric intubations. Briefly explain why, historically, uncuffed tubes were preferred (2 marks)

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QUESTION 11 (17 marks)

A 75 year old man has been resuscitated following an out-of-hospital cardiac arrest. He has been taken to a small regional Emergency Department. He was intubated at scene. His past history is unknown but paramedics have brought a bag of his normal medications: frusemide, spironolactone, digoxin and warfarin.

**THE PATIENT'S ECG IS SHOWN IN THE PROPS BOOKLET, PAGE 7**

- i. What are the 3 main findings in this ECG? (3 marks)

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- ii. List 3 potential causes of the dysrhythmia in this patient (3 marks)

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- iii. A retrieval team has been dispatched by helicopter with an estimated flight time of 2 hours. For the safe transfer of this patient, list the minimum monitoring modalities required (5 marks)

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- iv. Complete the following table, listing 3 common issues with the helicopter transport environment and their potential effects on patient assessment/management (6 marks)

| Issue | Effects |
|-------|---------|
|       |         |
|       |         |
|       |         |

## QUESTION 12 (14 marks)

A 36 year old woman presents with a very sudden onset severe headache 5 hours ago. It is suspicious for subarachnoid haemorrhage (SAH).

(i) Apart from headache, list 4 other clinical features that may be present in SAH (4 marks)

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(ii) Complete the table providing estimates where indicated (3 marks)

| Situation   | Estimate |
|---|----------|
| Prevalence of confirmed SAH in a patient with a classic history of “thunderclap” headache |          |
| Sensitivity of new generation CT scanning in detecting SAH in this setting                |          |
| Incidence of “traumatic tap” when performing a lumbar puncture (LP)                       |          |

(iii) The CT scan of this patient is reported as normal and a decision made to perform a lumbar puncture to look for xanthochromia. Name the two red cell breakdown products that can cause yellow discolouration of CSF (2 marks)

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(iv) List 5 criteria that indicate that a CT scan should be carried out prior to lumbar puncture (5 marks)

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QUESTION 13 (15 marks)

A 72 year old male is brought to ED by family with pain and swelling in his left calf for the last 24 hours. He has a history of myelodysplasia and denies trauma. On examination the calf is swollen and tender.

- i. List 4 possible causes of his calf pain (4 marks)

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In the ED, the patient continues to complain of pain despite opiate analgesia. His leg is increasingly swollen and now is erythematous with palpable crepitus. Vital signs are as follows:

GCS 15

Temp 37.8C

HR 120

BP 66/40

Sats 96% RA

- ii. List your immediate management priorities in this patient. Include drugs, doses and end points where appropriate (5 marks)

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iii. List 3 risk factors for this condition (3 marks)

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iv. The patient's hypotension remains refractory to fluid treatment and you decide to start vasoactive therapy. Give an example of a suitable medication for this patient with typical dosing/concentrations and treatment end points (3 marks)

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QUESTION 14 (12 marks)

A 5 month old boy brought in by his parents appears breathless and is “off his feeds.” Your provisional impression is bronchiolitis.

- i. Name three common organisms which cause this illness (3 marks)

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- ii. List 4 clinical features which would indicate a severe episode warranting admission (4 marks)

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- iii. Complete the following table describing the rationale for each investigation in a child with bronchiolitis (3 marks)

| Investigation           | Indication/Rationale |
|-------------------------|----------------------|
| Chest Xray              |                      |
| Nasopharyngeal aspirate |                      |
| Blood gas               |                      |

- iv. This illness is contagious. List 2 ways to reduce transmission in hospital (2 marks)

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QUESTION 15 (15 marks)

A 27 year old man climbed over an electricity sub-station fence and sustained an electrical injury while grabbing a metal pole with his right hand. He arrives 30 minutes later complaining of tingling in his right arm and a numb left foot.

**A CLINICAL PHOTOGRAPH IS SHOWN IN THE PROPS BOOKLET, PAGE 8**

- i. Describe the wound seen on the foot (1 mark)

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Question continues next page



- ii. Complete the table outlining factors that determine the severity of an electrical injury (8 marks)

| Category        | Explanation |
|-----------------|-------------|
| Voltage         |             |
| Current         |             |
| Resistance      |             |
| Type of current |             |

- iii. For each of the three categories below, what specific injuries or problems may occur in the patient described in the stem? For each, describe the patho-physiological process (6 marks)

|                  | Injury | Pathophysiology |
|------------------|--------|-----------------|
| Cardiac          |        |                 |
| Nervous system   |        |                 |
| Limb/soft tissue |        |                 |

QUESTION 16 (19 marks)

An 80yr female presents via ambulance from her GP to your ED. She has a 24 hour history of vomiting, followed by syncope this morning. She had a second syncope at her GPs office and was noted to be bradycardic on ambulance arrival.

Observations on arrival to ED are:

GCS 15

HR 76

BP 85/30

RR 18

SaO<sub>2</sub> 96% RA

She describes no chest pain, has had a recent course of antibiotics for a chest infection and has started on a “new drug for my memory”.

**THE PATIENT’S AMBULANCE RHYTHM STRIP AND ARRIVAL ECG ARE SHOWN IN THE PROPS BOOKLET, PAGE 9 & 10**

- i. List 3 relevant findings from the 12 lead ECG (3 marks)

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- ii. List 3 causes of the ECG abnormalities in this patient (3 marks)

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iii. List your management priorities (4 marks)

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She becomes bradycardic to 35 again, and her BP drops to 75/30 with a rhythm matching the initial ambulance ECG strip.

iv. What is her likely diagnosis? (1 mark)

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v. You decide to initiate transcutaneous pacing for her transfer to ICU. Outline your approach (5 marks)

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QUESTION 17 (16 marks)

A 40-year-old female who is Day 3 post-partum has been brought in following increasing confusion and agitation at home.

In the ambulance she had a generalised tonic-clonic seizure which stopped with 5mg IMI midazolam.

When you arrive she is being nursed on a bed in the Resuscitation Room.

On examination:

Airway: snoring / partly obstructed

RR 40, O2 saturations 95%

HR 130, BP 180/100

Decreased LOC – drowsy, post-ictal, GCS 9

- i. Apart from eclampsia, list the causes of seizure you would consider in this patient (4 marks)

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- ii. List 3 risk factors for pre-eclampsia/eclampsia (3 marks)

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- iii. What examination features would increase your level of suspicion that this seizure is eclamptic in origin? (3 marks)

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- iv. Outline your initial management in each category below. Include drugs/dose/route (where appropriate) that you would administer (6 marks)

| Category                                   | Management |
|--|------------|
| General management & resuscitation         |            |
| Pharmacotherapy of eclampsia/pre-eclampsia |            |

## QUESTION 18 (16 marks)

A 25 year old man presents 6 hours after a SCUBA dive with possible decompression sickness (DCS).

- i. List 6 questions specific to diving you should ask in your history (6 marks)

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- ii. Complete the table listing 3 symptoms or signs of DCS in each category (6 marks)

| Category     | Symptom/Sign |
|--------------|--------------|
| Neurological |              |
| Other        |              |

iii. Complete the table contrasting DCS and Arterial Gas Embolism (AGE) (4 marks)

|                 | DCS | AGE |
|-----------------|-----|-----|
| Pathophysiology |     |     |
| Time of onset   |     |     |



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# **BOOK THREE**

**QUESTION 19 (21 marks) – DOUBLE QUESTION**

A 70 year old man presents with ischaemic-sounding chest pain on a background of longstanding, poorly controlled hypertension. His 12-hour troponin is normal.

**THE PATIENT’S ECG IS SHOWN IN THE PROPS BOOKLET, PAGE 11**

i. List 4 abnormalities in this ECG (4 marks)

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ii. List 5 causes of ST segment elevation other than myocardial ischaemia (5 marks)

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iii. The patient is noted to have a systolic heart murmur. List 6 differential diagnoses of a systolic murmur (6 marks)

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iv. You suspect this patient has aortic stenosis. What are the physical signs that suggest severe aortic stenosis? (4 marks)

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v. Your registrar wants to commence a nitrate infusion for this man's angina. Outline your concerns about this plan (2 marks)

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QUESTION 20 (14 marks)

A 42-year-old man is brought to your ED by ambulance with acute confusion. His health has been deteriorating for three months, with tiredness & 10kg weight loss despite an enormous appetite. He is on no medications.

Observations on arrival are:

HR 140

BP 180/100

RR 40

SaO<sub>2</sub> 100%

GCS 13

Temp 38.5

BSL 10

- i. List the most likely diagnosis (1 mark)

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- ii. List 4 differential diagnoses (4 marks)

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iii. List 4 problems that may precipitate the most likely diagnosis (4 marks)

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iv. List 5 treatment priorities in ED (5 marks)

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QUESTION 21 (11 marks)

Ambulance officers bring a 68 year old man with severe back pain to your ED. He is shocked (BP 80/50mm Hg). Your trainee has performed a bedside ultrasound and obtained this image.

**A CLINICAL IMAGE IS SHOWN IN THE PROPS BOOKLET, PAGE 12**

- i. Describe the image (2 marks)

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- ii. List the most likely diagnosis and one differential diagnosis (2 marks)

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The on-call vascular surgical registrar has asked you to continue to resuscitate the patient and get an urgent CT while he organises theatres.

- iii. What is the role of CT scanning in this setting? (2 marks)

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- iv. List the key steps in your ongoing resuscitation and preparation for theatres (5 marks)

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QUESTION 22 (13 marks)

You are the retrieval doctor at a pre-hospital scene where there has been a single-occupant rollover MVA. The driver has been trapped for 2 hours by extensive compression of both legs by dashboard and steering column intrusion. He has chest and head injuries (GCS 7)

- i. What are the potential pathophysiological consequences of rapid release of this patient's legs? (2 marks)

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- ii. What therapies could you use to mitigate these pathophysiological consequences? (3 marks)

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On arrival at the nearby trauma centre, concerns are raised about the possibility of a bilateral lower leg compartment syndrome.

- iii. Outline a technique for measuring compartment pressures (4 marks)

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- iv. What pressure threshold would confirm suspicions of compartment syndrome?  
(1 mark)

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- v. The patient's creatine kinase is 7000 IU/L. The renal registrar wants you to start a mannitol infusion to reduce renal injury from tubular deposition. List 3 disadvantages or adverse effects of mannitol in this context (3 marks)

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QUESTION 23 (13 marks)

A 24 year old woman with a history of asthma presents with dyspnoea, dizziness and pleuritic chest pain for 24 hours. She appears tired, her pulse is 135bpm, and has mottled peripheries. A CXR is performed in the resuscitation room.

**THE CHEST XRAY IS SHOWN IN THE PROPS BOOKLET, PAGE 13**

- i. List 3 positive and 2 negative findings on the CXR (5 marks)

Positive

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Negative

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- ii. List 4 immediate management steps (4 marks)

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iii. List 4 complications of definitive treatment of this problem (4 marks)

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QUESTION 24 (15 marks)

You are at a peripheral hospital with no paediatric or neonatal facilities when a 23 year old female presents in advanced labour. You have been asked to care for the baby after birth.

- i. List 5 of the most important factors that the mother or baby may have that will increase the risks of the infant needing resuscitation (5 marks)

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- ii. List 3 ways you can estimate the gestational age of the infant (3 marks)

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- iii. On delivery, the baby is limp, with poor respiratory effort and a HR of 90/min. List 5 of your immediate actions to resuscitate the baby (5 marks)

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- iv. If this is a term infant should you resuscitate with air or a higher concentration of oxygen? Provide reasons for your answer (2 marks)

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## QUESTION 25 (19 marks)

- i. Complete the table comparing lightning vs high voltage injury (10 marks)

| Factor                        | Lightning | High Voltage AC |
|-------------------------------|-----------|-----------------|
| Current duration              |           |                 |
| Current characteristics       |           |                 |
| Energy level                  |           |                 |
| Cardiac arrest initial rhythm |           |                 |
| Tissue damage                 |           |                 |

- ii. There are several different types of lightning strike. List 2 types and briefly describe them (4 marks)

| Type of strike | Description |
|----------------|-------------|
|                |             |
|                |             |

- iii. Describe 2 clinical features which are considered pathognomonic for lightning strike (2 marks)

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- iv. List 3 other clinical features seen in lightning strike (3 marks)

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## QUESTION 26 (14 marks)

A 67 year old male with a urethral catheter in situ for 2 months, awaiting TURP, presents with a blocked IDC which has been changed. Routine pathology tests were performed.

|          |           |             |          |
|----------|-----------|-------------|----------|
| Na 137   | (135-145) | Bilirubin 5 | (3-20)   |
| K 4.3    | (3.5-5.2) | Prot 68     | (60-80)  |
| Cl 104   | (95-110)  | Alb 38      | (32-46)  |
| Bic 22   | (22-32)   | ALP 585     | (30-110) |
| Urea 5.2 | (3-8)     | GGT 47      | (9-36)   |
| Creat 67 | (45-90)   | ALT 13      | (<55)    |
| eGFR 94  | (>60)     | AST 39      | (12-36)  |

- i. List 2 possible causes for the pathology abnormality (2 marks)

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- ii. List 3 further pathology tests you would perform and provide reasoning (6 marks)

| Test | Clinical reasoning |
|------|--------------------|
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|      |                    |
|      |                    |



iii. List 5 malignancies that metastasize to bone (5 marks)

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iv. What type of bony metastases occurs in prostatic malignancy? (1 mark)

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## QUESTION 27 (19 marks)

A 67 year old woman has presented having found her blood pressure to be 205/130 on her home BP machine.

- i. Define hypertensive emergency (2 marks)

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- ii. An image of the patient's retina is shown. Name two abnormalities seen (2 marks)

**A CLINICAL PHOTOGRAPH IS SHOWN IN THE PROPS BOOKLET, PAGE 14**

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- iii. List and justify 3 blood tests you might order in this patient (6 marks)

| Blood Test | Justification |
|------------|---------------|
|            |               |
|            |               |
|            |               |

- iv. Acute lowering of BP in profoundly hypertensive patients is indicated in a number of specific settings. Complete the table including two medications for each condition listed (doses not required). Identify the therapeutic goal and the blood pressure target (12 marks)

| Diagnosis                 | Preferred agents (2 marks each) | Goal/Target (2 marks each) |
|---------------------------|---------------------------------|----------------------------|
| Aortic dissection         |                                 |                            |
| Myocardial ischaemia      |                                 |                            |
| Intracerebral haemorrhage |                                 |                            |