



**PARAMEDIC SCIENCE (576103)**  
**NON FORMAL**  
**Recognition of Prior learning (RPL)**  
**CHALLENGE TEST**

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## **The Process**

Applicants for Non Formal RPL in this paper will have one of two New Zealand Emergency Medical Technician (EMT) qualifications: National Diploma in Ambulance Practice, National Certificate in Ambulance - Patient Care & Transport or an equivalent international EMT qualification.

Candidates that enter the non-formal RPL process are effectively saying that they have sufficient knowledge of the Paramedic Science content and are proving currency. To this end, it is not the role of the university to coach applicants for the assessment.

This paper develops clinical assessment competencies and clinical reasoning when managing traumatic and acute medical emergencies. The key learning guidelines will help applicants prepare for the challenge test.

Candidates should refresh their knowledge by reading course material from their EMT studies in tandem with reading the Paramedic Science required text Porth, C. M. Pathophysiology – concepts of altered health states [most recent edition]. Philadelphia: Lippincott, Williams & Wilkins.

## **Challenge Test**

The challenge test involves 2 written examinations.

Time allowed: 2 hours per paper. Both written examinations are held consecutively with a short break between.

The Pass requirement is 130 points of a possible 200 points.

Candidates where possible should sit this assessment on campus; if distance is prohibitive candidates should advise the Paramedic Programme Administrator [maxine.jordan@aut.ac.nz](mailto:maxine.jordan@aut.ac.nz) of the name of the St John Clinical Standards/education personnel that will adjudicate this assessment. Please also supply courier street address details. Off site exam conditions must comply with the university requirements, the university reserves the right to seek an alternative venue or insist that an applicant attends this challenge test on campus.

Results of this assessment are emailed to applicants within 21 days. Examination papers are retained by the university on your student file. A debrief of the examination can be arranged by appointment. Exam papers are destroyed at the end of the academic year.

Overall paper grade for challenge tests = CR / credit.

## Key Learning Points

The following key learning points outline the essential learning in Paramedic Science.

Some conditions effect more than one body system. It is important to consider the interaction of the whole body and assaults to homeostasis before venturing into to the top to toe study of trauma & medical conditions. After the systemic insult over view the key learning points are ordered in a similar fashion to the secondary survey to increase applied links of theory to paptient assessment and rationale for various clinical management decisions.

### Systemic Insults

- Define oxygenation, perfusion, and circulatory shock
- Compare and contrast the clinical presentation and pathology of various types of shock
- Explain the control of body temperature
- Compare and contrast Hypothermia versus Hyperthermia
- Explain the hormonal control of blood sugar
- Describe the aetiology of Diabetes Mellitus
- Compare and contrast the clinical presentation of hypoglycaemia versus hyperglycaemia
- Compare and contrast the patho-physiology of Type I versus Type II Diabetes
- Describe the general management of diabetes

Everything in medicine depends on accurate patient assessment; a provisional working diagnosis and treatment priorities will evolve from your patient assessment.

## Patient Assessment

Thorough patient assessment requires a reasonable knowledge of normal and building a high index of suspicion by being systematic.

- Differentiate disorders by interpreting and evaluating the diagnostic significance of various patterns of signs and symptoms.
- Define the terms “differential diagnoses” and “provisional working diagnosis” as it relates to your paramedic practice.
- Describe the term high index of suspicion
- What environmental considerations will you make when assessing patients (climatic & social conditions)
- Describe common patterns / mechanisms of injury
- Explain the significance and causes of signs and symptoms that each assessment technique may elicit or explore.

e.g. Various patterns of respiratory rate and depth (inspection)

Symmetry or asymmetry of chest wall movement (palpation)

Rales, rhonchi (includes wheeze, sibilant rhonchi) or rubs (auscultation)

- Describe the physiological mechanisms that produce the following lung sounds and their patho-physiological significance (if any):

Normal vesicular sounds	Unequal sounds
Absent sound	Rhonchi
Rales	Rubs

- Heart sounds 1, 2 and 3, and the patho-physiological significance of heart sound 3 are covered in Cardiology but you may wish to introduce yourself to this material.
  
- Explain the percussion sounds:
 

Resonance	Hyper-resonance
Tympany	Dullness
  
- Describe the pre-hospital use of pulse oximetry. Please note that this topic is covered in Intravenous Therapy & in the Advanced Life Support paper but you should yourself to this material in order that you can explain haemoglobin saturation and relate it to the partial pressure of oxygen - the oxygen - haemoglobin saturation curve.
  
- Assess CNS status utilising: history / GSC / Cranial Nerve assessment / Inspection / Palpation
  
- Describe functional assessment of peripheral nerves, reflexes & joint integrity

## **The Head**

Revise your previous human anatomy & physiology in order that you can:

- Describe the anatomy of the skull including facial bones, meninges, CSF, the major regions of the brain, the cranial nerves, and list the major vessels in the cerebral circulation
- Explain neuron activity
- Explain auto-regulation of cerebral blood flow
- Discuss nervous tissues response to oxygen, changes in carbon dioxide levels, response to acidosis or alkalosis, glucose deficiency
- CNS vs PNS capacity for regeneration
- Give an overview of the integrative functions of the CNS including the sensory and motor pathways, memory and consciousness

## **The Head**

- Describe common fractures of the skull & facial bones
- Discuss the clinical spectrum of Traumatic Brain Injury (TBI) - epidural haematoma, subdural haematoma, intra-cerebral haematoma, concussion, diffuse axonal injury
- Describe decorticate and decerebrate posturing
- Describe signs and symptoms of deteriorating head injury including Cushings reflex & coning
- Demonstrate a developing understanding of Secondary Brain Injury cascades and the impact of hypotension, hypoventilation, and acidosis; hypertension, hypocarbia, and alkalosis; and hypoxia
- Make pertinent links between patho-physiology & patient assessment techniques for head injured patients. Ensure you are able to use the Glasgow Coma Score (Best Eye Opening - 4, Best Verbal Response – 5, Best Motor Response – 6 )
- Discuss the primary aims of head injury management by using the cerebral blood flow equation  $CPP = MAP - ICP$
- Discuss the management principles for general care of the unconscious patient, stroke patients, and the patient with seizures
- Describe the possible causes of unconsciousness
- Define epilepsy, aura, tonic, clonic, postictal, absence seizure, generalised seizure, complex-partial seizure, status epilepticus
- Distinguish an epileptic seizure from seizures due to other causes

- Discuss the aetiology of stroke, the substitution of the term “brain attack”, the contrasting pathology of haemorrhagic vs ischaemic stroke, the significance of transient ischaemic attack, and common causes of subarachnoid haemorrhage
- Discuss current research & management of stroke

### **The Neck**

- Revise anatomy & physiology of structures of the neck
- Apply your understanding of cranial nerves to structures of the neck

Describe the aetiology of each disorder listed below plus compare & contrast the disorders:

- Tonsillitis Vs Quincy
- Epiglottitis Vs Croup
- Myxedema Vs Hyperthyroidism
- Oesophageal Varices Vs Oesophagitis
- Hangmans # Vs C 4 # Vs C 7#
- Torticollis Vs Whiplash

Describe the following assessments:

- Carotid pulse
- Carotid bruit
- Tracheal deviation
- JVP assessment
- Lymphadenopathy

## **The Spine**

Revise your previous human anatomy & physiology in order that you can:

Describe the anatomy of the spinal column:

- The total number of vertebrae
- The five regions of the spine
- The intervertebral discs
- The curves of the spine

Label and describe the parts of the typical vertebrae:

- Vertebral body
- Spinal canal
- Neural arch
- Intervertebral foramen
- Processes - Spinous process  
Transverse processes
- Superior and inferior articular processes
- Facets

Label and describe the parts of the spinal cord:

- Trace a peripheral afferent & efferent neuron from its site in the periphery through its exit or entry into the spinal cord

## **The Spine**

List probable mechanics of spinal injury:

- Acceleration - Deceleration resulting in:

- Hyperflexion
- Hyperextension
- Deformation
- Axial Loading / compression injuries
- Excessive Rotation

Describe specific assessment techniques pertinent to the patient with a suspected spinal injury. Discuss the use of dermatomes and peripheral nerve distribution in spinal injury assessment

Describe signs and symptoms of spinal injury at various cord levels; central, anterior, lateral (Brown Sequard) and Horner's syndromes; explain the patho-physiology that produces the signs to include:

- Changes in respiratory effort
- Hypotension
- Hypothermia
- Bradycardia

Explain the terms and utilise examples of the degree of disability experienced for:

- Quadriplegia / Tetraplegia
- Paraplegia
- complete / partial lesion

Explain the overriding concerns in the handling and management of the patient with a spinal injury.

## The Thorax

Revise anatomy & physiology of the thorax in order that you understand the principles governing the movement of air in the lungs, the diffusion of gases across the alveolar capillary interface, physiological shunt, interaction of the heart, lungs and major vessels in the mediastinum, and compensatory mechanisms.

Describe the following conditions in order that you can compare and contrast aetiology, pathophysiology, and presentation:

- Obstructive Airway Disorders: asthma / emphysema / chronic bronchitis
- Make links with allergic reactions leading to severe anaphylactic shock and asthma
- Breathing Disorders: hyperventilation syndrome / sleep apnea
- Disorders of Lung Inflation: pneumothorax / haemothorax / tension pneumothorax / pleural effusion / atelectasis
- Pulmonary vascular disorders: pulmonary embolism / fat embolism / ARDS
- Toxic inhalations / carbon monoxide poisoning
- Alteration of respiratory function due to pneumonia, Tb, neoplasm
- Intro to Cardiac Disorders: AMI / angina / congestive heart failure
- Cardiac tamponade
- Dissecting thoracic aneurysm

## **Dive Medicine**

- Explain the significance of Boyles & Henrys Law for the diver
- Describe what happens to body air filled cavities and spaces within the divers suit or mask during ascent or descent
- Describe Dive Emergencies: decompression illness(DCI) / nitrogen narcosis / air embolism / arterialisation
- Pre-hospital patient management for dive emergencies
- Discuss the use of decompression for the treatment of frostbite, poor wound healing, gangrene and other medical conditions.

## Overview of Pain

- Define pain
- Describe the afferent pathways of nociceptors, and the spinothalamic tract
- Demonstrate an understanding of pain theorists including gate-control theory
- Define pain threshold
- Describe techniques used to assess pain
- Explain methods of pain management, both non-medicinal and medicinal
- Define the term narcotic and outline the receptor site theory that explains how narcotics achieve their effect
- For the following pain relief medication: Morphine, Methoxyflurane, Entonox & Paracetamol state:

The drug's type

Physiological actions

Indications and contraindications

Adverse effects

Preparation

Dosage and route of administration

- Explain how the narcotic antagonist Narcan achieves its effects

## The Torso

- Develop a general knowledge of conditions that present acutely in the torso
- Divide the abdomen into four quadrants and list the organs located in each quadrant
- Revise all associated anatomy
- Define the regions: epigastric, periumbilical, suprapubic, retro peritoneal

**Gastro-intestine** compare & contrast the aetiology and presentation of disorders of the gastrointestinal system: gastroenteritis, oesophageal varices, oesophagitis, hiatus hernia, peptic ulcer, pyloric stenosis, duodenal ulcer, crohns, diverticulitis, appendicitis, bowel obstruction, perforated bowel

**Renal** compare & contrast the aetiology and presentation of disorders of the renal system: adrenal disorders, renal colic, cystitis, urinary tract infection

**General Torso** describe the aetiology & presentation of cirrhosis, cholecystitis, obstructive biliary colic, pancreatitis, splenic trauma, diaphragmatic rupture, abdominal aortic aneurysm

**Reproductive System** Describe aetiology & presentation of ectopic pregnancy, sexual assault, pelvic inflammatory disease, torsion of testes, hydrocele

## The Extremities

- Describe the anatomy of the a long bone & a synovial joint
- List probable mechanics of limb fractures
- Describe the anatomy of the shoulder joint
- Describe the pelvis and the hip joint
- List common signs & symptoms of fractures & dislocations
- Classify fractures by location, type, degree, character
- Draw a flow diagram of the stages of bone healing
- Discuss the complications of musculo- skeletal injuries:
  - Blood loss
  - Infection / Osteomyelitis
  - Delayed Union / Non Union
  - Vascular compromise
  - Nerve Damage / Volkmans Contracture
  - Fat Embolism
- Identify a common range of fractures

Describe the anatomy of skin, muscles, ligaments, & tendons

- Describe how you would assess for a range of dislocations: AC joint, shoulder, elbow, anterior hip, posterior hip, patella, knee, ankle
- Describe joint injuries in terms of changes to range of motion, joint laxity, joint locking, subluxation or dislocation
- Describe how you would assess for a ruptured Achilles Tendon, Gastrocnemius rupture, a Rotator Cuff tear

## **Soft Tissues**

Compare the tissue involvement of the three different degrees of burn

State how to apply the rule of nines

Differentiate between:

- Contusion
- Haematoma
- Abrasions
- Lacerations
- Incisions
- Avulsions
- De-gloving
- Flap Injury
- Impaled objects
- Amputations
- Puncture wounds

Draw a flow diagram of wound healing

Describe Crush Injury Syndrome

Describe Compartment Syndrome