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JOHANNESBURG OFFICE
EXAMINATIONS & CREDENTIALS

January 2022

FCA(SA) PART I CURRICULUM

A P P E N D I X A

The following information is intended as a guide to candidates, and indicates the general scope of the examination in the three papers for the **Part I** examination.

PHYSICS and the PRINCIPLES of CLINICAL MEASUREMENT 1.0 PHYSICS

1.1 Basic units of measurement

1.2 Work, energy and power

1.3 Elementary mathematics relevant to anaesthesia (natural exponential functions, sine waves etc)

1.4 The gas laws

1.5 Manufacture, storage and supply of anaesthesia gases

1.6 Vapour pressure, latent heat, and vaporisers

1.7 Diffusion and osmosis

1.8 Solubility

1.9 Humidity and humidification

1.10 Heat, thermometry

1.11 Fires and explosions

1.12 Basic electricity, electrical safety, diathermy

1.13 Bernouli effect; Coander effect and anaesthetic applications

1.14 The electromagnetic spectrum and its application

1.15 Ultrasound and the Doppler principle

1.16 Transducers, damping coefficient, natural frequency

2.0 CLINICAL MEASUREMENT

2.1 **General:**

2.1.1 Units of measurement
2.1.2 Recording of display of biological potentials [ECG, EEG, EMG evoked potentials etc]
2.1.3 Electrodes [pH, PCO2, and PO2]
2.1.4 Measurement of flow and volume
2.1.5 Measurement of pressure, non-invasive and invasive transducers, damping etc
2.1.6 Measurement of electrolytes
2.1.7 Gas and vapour analysis 2.1.8

Tests of Organ Function:

2.1.8.1 Respiratory system
2.1.8.2 Cardiovascular system
2.1.8.3 Central nervous systems
2.1.8.4 Coagulation
2.1.8.5 Neuromuscular junction and blockade

2.2 **Anaesthesia Related Apparatus:**

2.2.1 The anaesthesia machine
2.2.2 Breathing systems
2.2.3 Ventilators
2.2.4 Filters
2.2.5 Monitors
2.2.6 Electrocardiograph machine
2.2.7 Cardiac defibrillators
2.2.8 Pacemakers
2.2.9 The effect of barometric pressure on functioning apparatus

2.3 **Basic Statistics:**

Candidates should understand the appropriate application of statistical tests to particular situations, but will not be expected to be able to perform the necessary calculations. Statistics should be learnt as a background for future research and to enable a candidate to evaluate the literature critically.

2.3.1 ***Basic research methodology:*** Randomisation and sampling; Hypothesis testing; Types of error; Power analysis; Types of data; Accuracy, bias, precision.

2.3.2 ***Descriptive Statistics:*** Types of distribution (Gaussian and non-Gaussian); Measures of central tendency - mean, median and mode; Measure of dispersion - standard deviation, standard error of the mean; Methods of displaying data graphically - histograms etc; Percentiles.

2.3.3 ***Distribution:*** Types of distribution; Standard deviation and standard error of the mean.

2.3.4 ***Statistical Tests:*** Probability and *p* values; Confidence intervals; Hypothesis testing for significance; Degrees of freedom; One-tail and two-tail tests; Student's *T* test; Analysis of variance; Chi-square test; Non-parametric tests (Wilcoxon, Mann-Whitney, Spearman); Odds ratios.

2.3.5 ***Comparison:*** Correlation and regression; Altman and Bland.

PHARMACOLOGY

1.0 PRINCIPLES:

1.1 General principles of pharmacology with particular attention to uptake, distribution, biotransformation and excretion of drugs and mechanism of drug action.

2.0 SYSTEMATIC PHARMACOLOGY:

This should include the pharmacology of:

2.1 General principles of receptor kinetics, pharmacokinetics and pharmacodynamics
2.2 Inhalational anaesthetic agents
2.3 Intravenous anaesthetic agents
2.4 Drugs blocking nerve conduction
2.5 Drugs blocking and stimulating autonomic pathways
2.6 Drugs affecting the neuromuscular junction and cholinergic receptors
2.7 Histamine, histamine antagonists; serotonin and antagonists
2.8 Drugs used in the relief of acute and chronic pain
2.9 Drugs producing anxiolysis, sedation, neurolepsis and amnesia
2.10 Drugs used in treatment of epilepsy, Parkinson's disease, depression, mania
2.11 Drugs affecting voluntary and involuntary muscle tone
2.12 Drugs influencing the conduction, contractility, rhythm, and myocardial oxygen supply and demand balance of the heart
2.13 Drugs influencing blood pressure
2.14 Drugs influencing haemostasis
2.15 Oxytoxic drugs
2.16 Drugs simulating, stimulating or blocking hormones
2.17 Drugs influencing thermoregulation
2.18 Antibiotics, chemotherapeutic agents and immunosuppressive drugs (detailed knowledge not expected)
2.19 Diuretics
2.20 General principles of drug interactions
2.21 Anti-emetic and anti-diarrhoeal drugs
2.22 Drugs modifying gastric pH, volume of gastric aspirate, gastric emptying and gastrointestinal smooth muscle tone
2.23 Contrast media
2.24 Intravenous colloids
2.25 Pharmacogenetics related to anaesthesia

PHYSIOLOGY…/

PHYSIOLOGY and CHEMICAL PATHOLOGY

The relevant chemical pathology under each section should be studied.

1.0 BASIC ASPECTS

1.1 Internal environment. Homeostasis. Control systems and mechanisms. The cell membrane. Intercellular and intracellular communication

2.0 WATER AND ELECTROLYTES

2.1 Body water. Osmolality. Osmolarity. Osmolar and anion gap
2.2 Sodium. Potassium. Magnesium. Calcium. Phosphate. Chloride
2.3 Water and electrolyte disturbances

3.0 CELL PHYSIOLOGY

3.1 Membranes. Membrane potentials. General cellular physiology
3.2 Basic genetics, genetic control of cellular activity and genetic diseases (eg Porphyria)

4.0 BLOOD

4.1 Blood cells. Blood groups. Platelets. Haemostasis. Fibrinolysis. Body defence mechanisms. Blood transfusions. Clinical tests of function

5.0 INTERMEDIARY METABOLISM

5.1 Carbohydrate metabolism; fat metabolism; protein metabolism - basic aspects. Aerobic and anaerobic metabolism. Energy metabolism

6.0 EXCITABLE TISSUES - NERVOUS SYSTEM

6.1 Action potential and graded responses. Membrane excitability
6.2 Neuromuscular transmission. Skeletal muscle physiology
6.3 Reflexes. Muscle tone
6.4 Basic function of spinal cord and brain
6.5 Synaptic transmission. Neurotransmitters
6.6 Sensory mechanisms - basic aspects
6.7 Physiology of pain
6.8 Body temperature
6.9 Motor function - basic aspects
6.10 Autonomic nervous system
6.11 Consciousness and sleep
6.12 Cerebral blood flow. Brain metabolism
6.13 Intracranial pressure. Cerebrospinal fluid - formation and flow

7.0…/

7.0 CARDIOVASCULAR SYSTEM

7.1 Transcapillary exchange. Oedema
7.2 Principles of blood flow. Compliance. Transmural pressures
7.3 Generation and conduction of the cardiac impulse. Common arrhythmias
7.4 Normal ECG
7.5 Cardiac cycle and cardiac sounds. Pressure changes in atria and ventricles
7.6 Cardiac output. Preload, afterload, contractility, the work of the heart
7.7 Blood pressure. Central venous and wedge pressures
7.8 Control of the circulation
7.9 Myocardial blood flow and metabolism
7.10 Pathophysiology of myocardial ischaemia, shock, hypertension, anaemia, and cardiac failure
7.11 The regulation of blood pressure
7.12 Tests of cardiac function

8.0 RESPIRATORY SYSTEM

8.1 Oxygen and carbon dioxide homeostasis
8.2 Pulmonary circulation. Transcapillary exchange. Pulmonary oedema
8.3 Characteristics of the respiratory centre
8.4 Pressures in the respiratory system
8.5 Lung volumes and capacities
8.6 Respiratory minute volume. Alveolar ventilation. Dead space
8.7 Respiratory muscle. Mechanism of spontaneous ventilation
8.8 Physiology of mechanical ventilation
8.9 Ventilation-perfusion relationships
8.10 Elasticity and compliance. Flow resistance. Work of breathing
8.11 Alveolar gas exchange
8.12 Gas transport to and from the tissues. Oxygen consumption and CO_2 production
8.13 Effects of barometric pressure
8.14 Control of ventilation
8.15 Non-respiratory pulmonary function
8.16 Hypoxia and hypercarbia. Pathophysiology of respiration failure - basic aspects
8.17 Pulmonary function tests

9.0 URINARY SYSTEM

9.1 Glomerular filtration. Renal blood flow. Re-absorption and secretion
9.2 Handling of water, electrolytes and other substances
9.3 Dilution and concentration of urine. Countercurrent mechanisms
9.4 Plasma clearance. Renin-angiotensin mechanisms
9.5 Renal function tests

10.0 ACID-BASE PHYSIOLOGY

10.1 Henderson-Hasselbalch equation
10.2 Chemical buffers
10.3 Acidosis and alkalosis

11.0 NUTRITION AND GASTRO-INTESTINAL SYSTEM

11.1 Enteral and parenteral nutrition - basic aspects. The lower oesophageal sphincter
11.2 Gastro intestinal function and secretion. Vomiting and regurgitation
11.3 Liver function tests. Pathophysiology of jaundice.
11.4 Hormones of the gastrointestinal tract

12.0…/

12.0 ENDOCRINE SYSTEM

12.1 Hypothalamus
12.2 Pituitary
12.3 Thyroid
12.4 Adrenal gland
12.5 Pancreas including abnormalities of glucose metabolism
12.6 Calcium and phosphate homeostasis
12.7 Mode of action of hormones
12.8 Prostaglandins, leucotrienes, encephalins and endorphins
12.9 Endocrine function of other organs (kidney, lung etc)

13.0 REPRODUCTIVE SYSTEM AND PREGNANCY

13.1 Physiology of pregnancy
13.2 Fetal circulation and adaptations after birth
13.3 Placental function and transfer mechanisms

14.0 NEONATAL PHYSIOLOGY

15.0 TEMPERATURE REGULATION

16.0 BASIC IMMUNOLOGY

16.1 Body defence mechanisms, allergy and anaphylaxis

FCA(SA) PART I RECOMMENDED READING LIST

All Three Subjects:

1. Miller RD. *Anesthesia*. Churchill Livingstone, Latest Edition
2. *Annual ASA refresher course lecture notes*
3. *Relevant journal articles*
4. Morgan GE, Mikhail MS, Murray MJ. *Clinical anesthesiology.* Stamford, Conn. Prentice-Hall. Latest Edition

Biochemistry:

6. Murray RK, *Harper's illustrated biochemistry.* New York, London. McGraw-Hill. Latest Edition

Chempath:

7. Walmsley RN, White GH. *A guide to diagnostic clinical chemistry.* Oxford. Blackwell Scientific Publications. Latest Edition

Pharmacology:

8. *SA medicines formulary.*
9 Stoelting, RK. *Pharmacology and physiology in anesthetic practice.* Philadelphia. Lippincott-Raven, Latest Edition
10. Neal MJ. *Medical pharmacology at a glance.* Oxford. Blackwell Science, Latest Edition
11. Rang HP, Dale MM, Ritter JM. *Pharmacology*. Edinburgh. Churchill Livingstone, Latest Edition
12. Bovill JG, Howie MB. *Clinical pharmacology for anaesthetists.* London. WB Saunders, Latest Edition
13. Calvey TN, Williams NE. *Principles and practice of pharmacology for anaesthetists*, Oxford. Blackwell Science, Latest Edition
14. Kaufman L, Taberner PV. *Pharmacology in the practice of anaesthesia.* London. Arnold, Latest Edition
15. Milner A, Welch E. *Applied pharmacology in anaesthesiology and critical care*. Centurion. Medpharm 2012

Physics:

16. Davis PD, Kenny GNC. *Basic physics and measurement in anaesthesia.* Oxford. Butterworth Heinemann, Latest Edition
17. Aitkenhead AR, Moppett I, Smith JT Aitkenhead's *Textbook of Anaesthesia*, Latest edition
18. Dorsch JA, Dorsch SE. *Understanding anesthesia equipment.* Baltimore. Williams & Wilkins, Latest Edition
19. Sykes MK, Vickers MD. *Principles of measurement and monitoring in anaesthesia and intensive care.* Blackwell, Latest Edition

Physiology:

19. Guyton AC, Hall JE. *Textbook of medical physiology.* London. WB Saunders, Latest Edition
20. Ganong WF. *Review of medical physiology.* Stamford, Conn. Appleton & Lange. London. Prentice Hall International, Latest Edition
21. West JB. *Respiratory physiology – the essentials.* Philadelphia. Lippincott Williams & Wilkins, Latest Edition
22. Stoelting RK. *Pharmacology and physiology in anesthetic practice.* Philadelphia. Lippincott-Raven, Latest Edition
23. Lumb AB. *Nunn's applied respiratory physiology,* Oxford. Butterworth-Heinemann, Latest Edition

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