# THE COLLEGES OF MEDICINE OF SOUTH AFRICA

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Reg No 1955/000003/08

## Examination for the Subspecialty Certificate in Endocrinology and Metabolism of the College of Physicians of South Africa

27 February 2020

Paper 1 (3 hours)

*All questions are to be answered. Each question to be answered in a separate book (or books if more than one is required for the one answer)*

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1 a) i) Briefly discuss the concept of “Time in Range” for continuous glucose monitoring (CGM), with the recommended targets for non-pregnant type 1/ type 2 diabetics. (5)

ii) In pregnancy, briefly discuss the concept of “Time in Range” for CGM, with the recommended targets for assessment of glycaemic control (targets can be tabulated). (5)

iii) Discuss the various mechanisms used to prolong the mechanism of action of insulin. (5)

b) A 27-year-old woman was recently diagnosed with rheumatoid arthritis, for which she is still receiving oral glucocorticoids. Due to a strong family history of osteoporosis she is referred to you.

i) Discuss the mechanisms of glucocorticoid-induced osteoporosis. (5)

ii) Discuss how you would manage this patient. (5)

iii) Briefly discuss screening protocols for complications of osteogenesis imperfecta type 1 in adults. (5)

c) A 53-year-old woman had hypercalcaemia detected on routine bloods following a total abdominal hysterectomy and bilateral oophorectomy. On repeat special investigations her calcium was found to be 2.85 mmol/L (normal: 2.15-2.50), the phosphate was 0.68 mmol/L (normal 0.80-1.40), and PTH was (18 high). The serum creatinine and total 25-OH Vitamin D levels were normal. The DEXA-scan demonstrates T-scores of -2.7 to -2.4 (cortical as well as trabecular sites affected). In spite of counselling she refuses surgery.

i) Discuss the non-surgical management of primary hyperparathyroidism, including

1. Recommended monitoring. (3)
2. Nutritional guidelines. (2)

ii) Discuss 2 drug classes used in the medical management, including data on efficacy in this condition. (5)

iii) Discuss the mechanisms of action of calcimimetic drugs. (5)

d) A 48-year-old man with acromegaly had transsphenoidal surgery for a pituitary macroadenoma. Briefly discuss the following

i) The post-operative evaluation of this patient. (3)

ii) The biochemical diagnosis of persistent active acromegaly outlining the therapeutic targets for control. (3)

iii) Therapeutic options for persistent disease. (4)
iv) The molecular mechanisms of GHR activation and signal transduction. (5)
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2 a) Write short notes on the following
i) Role of glucagon in the pathophysiology of type 2 diabetes. (5)
ii) Discuss interventions and their evidence that have been shown to induce diabetes remission in obese patients with Type 2 diabetes. (5)
iii) Discuss the clinical manifestations and consequences of diabetic cardiac autonomic neuropathy. (5)

b) A 28-year-old man reports a chronic history of headaches, fatigue and loss of weight. Clinical examination reveals a goiter and sinus tachycardia of 102 beats/min. He is not using any drugs or supplements. Blood tests show a TSH of 7,4 (N: 0,35 – 5,5 mIU/L), Free-T4 of 28,9 (N: 11,5-22,1 pmol/l) and Free-T3 of 8,9 (N: 3,5-6,5 pmol/l). Analytical interferences have been excluded.
i) List 2 likely causes for this presentation. (2)
ii) How would the history and clinical examination be useful in this patient? (2)
iii) List 3 investigations and the interpretation of that investigation that would assist in differentiating between the two causes. (6)
iv) Briefly outline the specific management of the 2 diagnoses in i). (5)

c) i) Discuss parathyroid hormone (PTH) regulation of calcium transport in the kidney. (4)
ii) List the aetiology and types of hypoparathyroidism associated with Albright's Hereditary Osteodystrophy . (6)
iii) Discuss the indications for considering the use of recombinant human parathyroid hormone in hypoparathyroidism. (5)

d) i) Define complete (true) precocious puberty and list the potential causes. (5)
ii) Provide an approach to the evaluation of gynaecomastia in a 21-year-old man who is not on any form of drug therapy. (5)
iii) A 21-year-old woman with no significant medical history, reports 12-months of amenorrhoea. Menses were erratic since menarche which occurred at age 16 years. Laboratory results show an oestradiol of <45 pmol/l, luteinizing hormone of 76,1 IU/L and follicle stimulating hormone of 98,1 IU/L. Outline your plan for further investigations to determine the cause. (5)
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3 a) i) Under each heading below list 2 factors affecting growth hormone secretion (A table will suffice) (6)
1. Physiologic.
2. Pharmacologic.
3. Pathologic.

ii) A 42-year-old man explains that he underwent trans-sphenoidal surgery 3-years ago for a non-functional pituitary tumour. His symptoms had improved following the procedure but now complains of fatigue, postural hypotension, polyuria and polydipsia. His biochemical results are as follows

Fasting glucose : 5.5 mmol/L
Normal calcium
Insulin-like-growth factor 1: 87ug/L (135-449 ug/L)
Prolactin: normal
TSH: 1.4 mIU/L (0.27-4.20 mIU/L)
T4: 10 pmol/L (12-22 pmol/L)
Cortisol: 67 nmol/L (83-441nmol/L)
ACTH: not detectable
Magnetic resonance imaging shows a 1.2 x 1.5 x 1.1 cm sellar mass.

He declines further surgery. Discuss the management of the above patient under the following headings

1. Therapeutic goals. (3)
2. Therapeutic options available for this patient with regards to the mass. (2)
3. Which hormone do you replace first? (1)
4. What is the therapeutic target for thyroid hormone replacement? (2)
5. What is the likely cause of the polyuria and polydipsia? (1)

b) i) Discuss the mechanism of action of aldosterone (an annotated diagram will suffice). (5)

ii) Discuss any 3 cardio-metabolic complication of primary hyperaldosteronism and its mechanism. (6)

iii) Discuss current and future therapeutic interventions used to reduce the adverse cardio-metabolic and renal effects of excess aldosterone. (An annotated diagram will suffice). (4)

c) Glucose metabolism plays an important role in health and disease. Write short notes on glucose metabolism under the following headings

i) The origin, fate and utilisation of glucose. (7)

ii) How abnormalities in the glucose metabolism pathway may contribute to disease. (8)

d) Discuss the metabolism (catabolism) of the following hormones

i) Thyroid hormone. (5)

ii) Testosterone. (5)

iii) Catecholamines. (5)

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