

# Excretion & Reproduction Module – Year 1 Semester 2

Credits - 7

Duration: 7 weeks (35 days)

Concept	Objectives	Time	Department	T/L activity
	The student should be able to,			
<b>2008-1/SBM-5/01</b>				
<b>Introduction to excretion</b>	1. explain what is meant by excretion 2. explain why the body requires excretory mechanisms to maintain health 3. list the organ systems involved in excretion 4. list the waste products excreted by each of the above system 5. explain the role of the following in excretion (i). skin (ii). liver, biliary complex and the gut (iii). lungs (iv). kidneys and the urinary tract	1h	Biochemistry	Lecture
	6. examination of normal urine – Urinalysis (i). volume/ appearance/ osmolality/ pH (ii). presence of blood, glucose, protein (iii). cells, casts, bacteria	2h	Biochemistry	PD
<b>2008-1/SBM-5/02</b>				
<b>Posterior abdominal wall</b>	1. describe the posterior abdominal viscera	1h	Anatomy	Dissections
	2. describe the arrangement of muscles and fascia in the posterior abdominal wall			Lecture
	3. describe the structures found on the posterior abdominal wall	6h		Dissections

<b>2008-1/SBM-5/03</b>				
<b>Kidneys and the urinary tract</b>	1. list the components of the urinary system 2. describe the gross structure of the kidneys, Ureters and bladder 3. describe how the urinary system is adapted to perform its function 4. describe the unique blood circulation of the kidney 5. describe the venous drainage and nerve supply of the kidney 6. state the lymphatic drainage 7. describe the histological appearance of the urinary system	3h	Anatomy	Dissections
<b>a. Gross and microscopic anatomy of kidneys and the urinary tract</b>		1h		Lecture
		3×3h		Histology practical
<b>b. Osteology of the pelvis</b>	1. identify the bones and ligaments forming the pelvis. 2. name and identify the major foramina of the bony pelvis. 3. differentiate between the true pelvis and the false pelvis in terms of their structures and locations. 4. identify all bones found in this region and discuss the role of any associated tuberosities, grooves and prominences 5. describe the differences observed between the male and the female pelvis	3 h		Dissections
	Applied anatomy of the urinary system	1h		Lecture
<b>2008-1/SBM-5/04</b>				
<b>a. Normal imaging Anatomy of the urinary tract</b>	1. Identify the different imaging modalities used to assess the urinary system 2. Describe and identify the normal imaging anatomy of the urinary system	1h	Radiology	Lecture
<b>b. Imaging Anatomy of the common structural anomalies and dysfunction of the urinary system</b>	1. Identify the common structural anomalies and the dysfunctions of the urinary system in the different imaging modalities.	1h	Radiology	Lecture
<b>2008-1/SBM-5/05</b>				
<b>Development of the kidneys and the Urinary tract</b>	1. describe the development of the urinary system (i). pronephros (ii). mesonephros (iii). metanephros (Permanent Kidney) (iv). bladder and urethra	2h	Anatomy	Lecture

	2. describe the anatomical basis of the following <ul style="list-style-type: none"> <li>(i). congenital malformations</li> <li>(ii). congenital polycystic kidney</li> <li>(iii). pelvic kidney</li> <li>(iv). horse-shoe kidney</li> <li>(v). renal agenesis</li> <li>(vi). double ureter</li> <li>(vii). urachal fistula, cysts and sinuses</li> </ul>	1h	Anatomy	Lecture
<b>2008-1/SBM-5/06</b>				
	summarize the structural adaptations of the urinary system for effective function	2hrs	Anatomy	Student seminar with task
<b>2008-1/SBM-5/07</b>				
<b>Functions of the kidneys Formation of urine</b>	1. recognise that the functional unit of the kidney is the nephron. 2. list the two different types of nephrons and state the structural differences between them 3. describe the process of urine formation - filtration, secretion and reabsorption	1h	Physiology	Lecture
<b>2008-1/SBM-5/08</b>				
<b>GFR and factors affecting GFR</b>	1. describe the glomerular membrane, in terms of the major layers and its permeability characteristics. 2. explain in terms of size and electrical charges of the pores of the membrane and why the glomerular membrane has a high degree of selectivity. 3. state the glomerular pressure, Bowman's capsular pressure and the colloid osmotic pressure in the glomerular capillaries and explain how these pressures cause filtration of fluid at the glomerulus. 4. state the composition of the glomerular filtrate. 5. explain the terms GFR and filtration fraction and give their normal values. 6. describe the effect of the following on the GFR: <ul style="list-style-type: none"> <li>(i). renal blood flow</li> <li>(ii). afferent arteriolar constriction</li> <li>(iii). efferent arteriolar constriction</li> <li>(iv). sympathetic stimulation</li> <li>(v). outflow obstruction</li> </ul> 7. recognise that GFR is kept constant with wide changes in arterial blood pressure by means of "autoregulation".	2h	Physiology	Lecture
		2h	Physiology	SGD

2008-1/SBM-5/09				
<b>a. Tubular functions</b>  <b>b. Renal clearance, counter current mechanisms – 2h Lectures (+ 2h SGD)</b>  <b>c. Renal handling of water</b>	1. compare the structural characteristics and the absorptive properties of the epithelial cells in the proximal tubule, thin and thick segments of the loop of Henle, the diluting segment, the late distal tubule and the collecting duct. 2. recall the processes of primary and secondary active transport. 3. recognise that nutrients such as glucose, proteins, amino acids and vitamins are almost completely reabsorbed by active transport. 4. explain the process of glucose transport 5. explain the concept of tubular maximum as applied to glucose transport. 6. describe by giving examples the process of passive absorption Recognise that water transport occurs entirely by osmotic diffusion and state the volumes of fluid flowing per minute and percentages reabsorbed at different parts of the tubule. 7. recognise that major metabolic end-products such as urea and creatinine are poorly reabsorbed. 8. describe the process of reabsorption of electrolytes $\text{Na}^+$ , $\text{K}^+$ , $\text{Cl}^-$ and $\text{HCO}_3^-$ by the tubules.	3h	Physiology	Lecture
	<b>Clearance</b> 1. explain the concept of plasma clearance and indicate how clearance of a substance is affected by reabsorption and secretion. 2. explain how GFR can be measured by using inulin, creatinine and urea. state the advantages and disadvantages of the above substances as measures of GFR. 3. explain how PAH (para-aminohippuric acid) is used to measure renal plasma flow	1h	Physiology	Lecture
	1. explain the role of ADH in producing a dilute urine. 2. explain how the loop of Henle functions as a countercurrent multiplier and the vasa recta function as countercurrent exchangers. 3. explain the role of ADH and the countercurrent mechanism in concentrating urine. 4. explain the hypothalamic mechanism controlling ADH secretion and thirst. 5. state the normal range of volume, specific gravity and osmolality of urine. 6. explain the terms: water diuresis, osmotic diuresis, pressure diuresis. 7. measure volume and specific gravity of urine.	1h	Physiology	Lecture
		2h	Physiology	SGD

[illegible]

	<p>I. explain the effect of arterial baroreceptors, low pressure receptors, ANP, aldosterone and ADH in maintaining blood volume and ECF volume.</p> <p>j. explain the mechanism of <math>K^+</math> reabsorption and secretion in the renal tubules.</p> <p>k. explain the effect of aldosterone in the control of <math>K^+</math> secretion.</p> <p>5. describe the regulate pH of the body fluids</p> <p>*** <b>Role of the kidney in regulation of BP</b></p>	1h  4h + 1h	Anaesthesia	Lecture  <b>CCR</b>
<b>2008-1/SBM-5/13</b>				
<b>Regulation of Acid Base Balance</b>	<p>1. recall the buffer systems found in the body fluids</p> <p>2. recall the role of the kidney in the acid base balance</p> <p>3. describe results of loss of regulation of acid base balance</p>	1h	Anaesthesia	Lecture
<b>2008-1/SBM-5/14</b>				
<b>Renal function in different physiological stages</b>	<p>functions of the kidney in:</p> <ol style="list-style-type: none"> <li>1. Extremes of ages – <ol style="list-style-type: none"> <li>1.1 Childhood</li> <li>1.2 Old age</li> </ol> </li> <li>2. Pregnancy</li> </ol>	1h 1h 1h	Paediatrics Medicine Gyn & Obs	Lecture Lecture Lecture
<b>2008-1/SBM-5/15</b>				
<b>a. Mechanisms of dysfunction of the kidneys and the urinary tract</b>	<p>1. list the physiological consequences of reduced nephron mass, GFR., tubular function etc</p> <p>2. list 5 major causes that can lead to reduced GFR.</p> <p>3. list the effects of reduced GFR on function of other organ systems</p> <p>4. list the effects on the kidney due to altered functions of other systems</p> <p>5. list conditions which causes obstruction to the urine flow</p> <p>6. define the term renal failure</p>	2h	Medicine	Lecture
<b>b. Effects of abnormal renal function</b>	<ol style="list-style-type: none"> <li>i. identify abnormal constituents found in the urine in renal diseases</li> <li>ii. list important consequences of renal diseases</li> <li>iii. Assessment of renal dysfunction and failure</li> </ol>	1h	Medicine	Lecture
<b>c. Kidney and Homeostasis</b>	Round up session using clinical case demonstration	2h	Medicine	Lecture
<b>2008-1/CLM-5/01</b>				

<b>Abnormal constituents of urine</b>	i. Abnormal constituents of urine ii. Renal calculi	2h (x 3)	Biochemistry	PD
<b>2008-1/SBM-5/16</b>				
<b>Interaction between the urinary system and other systems</b>	1. list other systems which interacts with the urinary system 2. summarize the interactions	4h	Implementation by Physiology	CCR

<b>2008-1/SBM-5/17</b>				
<b>Introduction to human reproduction</b>	1. recall the stages of meiosis 2. compare and contrast meiosis and mitosis 3. describe the advantages and disadvantages of sexual reproduction	1h	Anatomy	Lecture
<b>2008-1/SBM-5/18</b>				
<b>Biological differences between male and female</b>	1. explain the structural, functional and behavioural differences between a male and female	1h	Psychiatry	Lecture
<b>2008-1/SBM-5/19</b>				
<b>An overview of reproduction</b>	1. define the terms primary and secondary sex organs 2 state the general function of the reproductive tract	1h	Physiology	Lecture
	3. biochemistry of sex hormones (i). state the sources, biosynthesis and metabolism of testosterone and give the sources of other androgens in the body (ii). describe the sources, biosynthesis and metabolism of the female sex hormones	2h	Biochemistry	Lecture
<b>2008-1/SBM-5/20</b>				

<b>Structure of male and female genital tracts and the breast</b>	1. describe the gross structure of the male and female genital systems	1h	Anatomy	Lecture
	2. describe the light microscopic appearance of the male and female genital systems	2×3 h	Anatomy	Histology Practical
	3. describe the gross structure and the light microscopic appearance of the breast 4. applied anatomy of the breast	1h	Anatomy to arrange	Lecture
<b>2008-1/SBM-5/21</b>				
<b>Normal imaging anatomy of the reproductive system</b>	1. Identify the different imaging modalities used to assess the male and female reproductive systems 2. Describe and identify the normal imaging anatomy of the male and female reproductive systems	1h	Radiology	Lecture
<b>Imaging Anatomy of the common structural anomalies and dysfunction of the male and female reproductive system</b>	1. Identify common structural anomalies and the dysfunctions of the reproductive system in the different imaging modalities.	1h	Radiology	Lecture
<b>2008-1/SBM-5/22</b>				
<b>Spermatogenesis and male sex hormones</b>	<u><b>Spermatogenesis</b></u> 1. recognise that spermatogenesis begins around puberty and continues throughout life 2. describe the process of formation of spermatids and the formation of male and female sperms. 3. state the role of Sertoli cells in spermatogenesis 4. state the role of the epididymis in sperm maturation and list the areas where sperms are stored 5. describe the structure and functions of the mature sperm 6. state the life span of a sperm in the (i). male genital tract (ii). ejaculate 7. state the functions of the male accessory sexual structures 8. describe semen in terms of; contributory sources/ volume/ appearance/ pH/ composition 9. state the normal sperm count and give the effect of the sperm count on fertility	2h	Physiology	Lecture
	<u><b>Male sex hormones</b></u> 10. state the pattern of testosterone secretion throughout the different	2h	Physiology	PD



	stages of life 11. explain the feedback regulation of testosterone secretion 12. explain the role of inhibin in spermatogenesis 13. state the effects of testosterone on (i). development of primary and secondary sexual characteristics in the adult (ii). body hair distribution and baldness (iii). voice /skin /muscular development (iv). bone and $\text{Ca}^{2+}$ metabolism (v). erythropoiesis			
<b>2008-1/SBM-5/23</b>				
<b>Ovarian cycle and female sex hormones</b>	1. recognise that female sex hormones are secreted in a monthly cyclical manner	3 h	Physiology	Lecture
	2. describe the hormonal, functional and histological changes in the human reproductive cycle in terms of the ovarian cycle/ the uterine cycle and the cervix/ vaginal changes/ breast changes	2h	Physiology	SGD
	3. describe the hormonal control of the reproductive cycle in terms of the interaction between hypothalamic, pituitary and ovarian hormones 4. recognise that the reproductive cycles cease around menopause 5. state the effects of the estrogens on (i). primary and secondary sexual organs (ii). the breasts (iii). the skeleton (iv). the skin (v). the pattern of fat deposition 6. describe the effects of progesterone on (i). the uterus (ii). the fallopian tube (iii). the breast (iv). Thermogenesis	4h + 1h	CCR group	CCR
<b>2008-1/SBM-5/24</b>				
<b>Adolescent behaviour</b>	1 define the term "adolescence" 2. explain the terms "gender, sex role identity"	1h	Psychiatry	Lecture
<b>2008-1/SBM-5/25</b>				
		1h	Psychiatry	Lecture

<b>a. Psychosocial aspects of human sexuality</b>	<ol style="list-style-type: none"> <li>1. describe briefly the psychosocial aspects of human sexuality</li> <li>2. explain the psychological concepts of masculinity and femininity</li> <li>3. explain the term "sexual orientation"</li> </ol>			
<b>b. Sexuality and sexual response</b>	<ol style="list-style-type: none"> <li>1. state the neuronal mechanism and the psychic stimuli involved in the male and female during the sexual act</li> <li>2. state the stages of the male sexual act including the role of the autonomic nervous system</li> <li>3. describe female orgasm and its associated physiological changes</li> <li>4. explain the physiological changes associated with the sexual act</li> </ol>	1h	Physiology	Lecture
<b>2008-1/SBM-5/26</b>				
<b>Fertilization and tubal functions</b>	<ol style="list-style-type: none"> <li>1. recall the pathway taken by sperms (spermatozoa) from the site of formation up to ejaculation</li> <li>2. describe the role of neural reflexes in controlling penile erection and ejaculation.</li> <li>3. state the period of viability and the conditions affecting viability of a sperm in the female genital tract.</li> <li>4. describe the process and timing of fertilization, and where it takes place.</li> <li>5. describe the structural and functional changes of the endometrium in relation to implantation and embryonic development</li> </ol>	1h	Physiology	Lecture
<b>2008-1/SBM-5/27</b>				
<b>Contraceptives</b>	describe the methods commonly used to prevent conception and their sites of action	1h 2h	Com. Medicine Physiology	Lecture PD
<b>2008-1/SBM-5/28</b>				
<b>a. Pelvis, reproductive organs etc.</b>	<ol style="list-style-type: none"> <li>1. name and identify the blood vessels that pass from the posterior abdominal wall into the pelvis.</li> <li>2. identify the branches of the anterior and posterior divisions of the internal iliac artery.</li> <li>3. relate the muscles of the pelvic wall and floor to one another and to</li> </ol>	8h	Anatomy	Prosections /Dissections

<b>c. Perineum</b>	<p>their attachments.</p> <p>4. differentiate between the pelvic diaphragm and the urogenital diaphragm.</p> <p>5. compare the organs in the female pelvis with those in the male pelvis.</p> <p>6. describe the clinical significance of the peritoneal fossae related to the uterus.</p> <p>7. describe the lymphatic drainage as it relates to the structures in this region.</p> <p>8. visualize and relate structures of the male and female pelvis with respect to adjacent structures.</p> <p>9. describe the differences between the male and the female pelvis</p> <p>10. applied anatomy of the pelvic organs</p> <p>11. describe the general layout of the perineum</p> <p>12. describe the urogenital diaphragm</p> <p>13. describe the superficial and deep perineal pouch</p> <p>14. describe the boundaries and regions of the perineum</p> <p>15. identify the muscles of the male and female perineum and their attachments.</p> <p>16. differentiate between the urogenital triangle and the anal triangle.</p> <p>17. identify the blood vessels and nerves supplying the structures of the perineum.</p> <p>18. pudendal block, epidural anaesthesia</p> <p>19. identify other regions into which the superficial fascial layers of the perineum are continuous.</p> <p>20. identify the major arteries supplying the perineum.</p> <p>21. describe the lymphatic drainage as it relates to the structures in this region.</p> <p>22. visualize and relate structures of the male and female perineum with respect to adjacent structures</p> <p>Applied anatomy of the pelvis and perineum</p>	2h		Body-side Tutorial
		1h		Lecture
		6h		Prosections /Dissections
		1h	Anatomy to arrange	Lecture
<b>2008-1/SBM-5/29</b>				
<b>Development of the male and female reproductive system</b>	development of the reproductive system including development abnormalities	4h	Anatomy	Lectures

<b>2008-1/SBM-5/30</b>				
<b>Menarche and associated problems</b>	identify common problems associated with menarche	1h	Gyn. & Obs.	Lecture
<b>2008-1/SBM-5/31</b>				
<b>Menopause and Andropause</b>	explain functional, structural and behavioural changes that occur during menopause and andropause	1h	Gyn. & Obs.	Lecture
<b>2008-1/SBM-5/32</b>				
<b>Pregnancy</b>	1. to appreciate the physiological and physical changes in pregnancy	1h 1h	Psychiatry Gyn. & Obs	Lecture Lecture
	2. describe the hormonal and physiological changes in mother during pregnancy	2h	Physiology	Lecture
<b>2008-1/SBM-5/33</b>				
<b>Parturition, puerperium and lactation</b>	1. describe the physiology of labour	1h	Physiology	Lecture
	2. list the hormones involved in lactation and describe their role	1h	Physiology	Lecture
	3. describe the process of milk ejection and the role of oxytocin in milk ejection			
	4. describe the patterns of prolactin secretion, its control by the hypothalamus and state its actions			
	5. appreciate the psychological effects of parturition, puerperium and lactation	1h	Psychiatry	Lecture
	6. appreciate the physiological and physical effects of parturition, puerperium, lactation and the post partum regaining of body structure	1h	Gyn. & Obs.	Lecture
<b>2008-1/SBM-5/34</b>				
<b>Physiology of the fetus</b>	1. describe the functional development of circulatory system and respiratory system of the fetus 2. describe the fetal adaptations for gas exchange 3. explain the readjustments at birth and changes in the neonatal period of the blood, circulation, respiration, kidneys, liver, digestive system, body temperature, metabolism and nervous system.	2h	Physiology	Lecture
<b>2008-1/CLM-5/02</b>				
	laboratory investigation of a subfertile couple	1h 2h x 3	Head/ NMU	Lecture (1h) PD (2h)

**Excretion & Reproduction Module – (Year 1 Semester 2)**  
**Module Summary**

Department	Lectures (hrs)	PD (hrs)	SGD (hrs)	CCR (hrs)	Dissections (hrs)	Student Seminar (hrs)	Total (hrs)
Anatomy	15	9			34	4	62
Biochemistry	7	4					11
Medicine	6						6
Physiology	26	6	6	8			46
Anaesthesiology	2						2
Paediatrics	1						1
Gyn. & Obs.	5						5
Psychiatry	5						5
Community Medicine	1						1
NMU	1	2					3
Radiology	4						4
<b>Total</b>	<b>73</b>	<b>21</b>	<b>6</b>	<b>8</b>	<b>34</b>	<b>4</b>	<b>146h</b>

**Names and the departments of the teachers involved in the teaching programme**

**Dept. of Anatomy**

Prof. Malkanthi Chandrasekera  
 Dr. S.B. Adikari  
 Dr. H. Amaratunga  
 Dr. D. Nanayakkara  
 Dr. A. Sominanda

**Dept. of Physiology**

Dr. A.A.J. Rajaratne  
 Dr. S.A. Rajaratne  
 Dr. A.S. Ariyasinghe

**Dept. of Biochemistry**

Dr. P.H.P. Fernando  
 Dr. H.K.I. Perera  
 Dr. S.B.P. Athahuda  
 Dr. J.G.S. Ranasinghe  
 Dr. W.I.T. Fernando

**Radiology**

Dr. S. Rosairo

**Dept. of Community Medicine**

Dr. D.S. Dissanayake

**Dept. of Paediatrics**

Dr. A. Abeygunawardena

**Dept. of Medicine**

Dr. T. Jayalath

**Examination Format****Dept. of Gyn. & Obs.**

Dr. C.R. Daya Dissanayake

**Nuclear Medicine Unit (NMU)**

Dr. J.M.C. Udugama

**Dept. of Psychiatry**

Dr. G.S.S.R. Dias

Module	Credits	Total duration of examination	MCQ	SAQ	OSPE
Excretion & Reproduction	7	4 Hrs.	1 Hrs.	1 ½ Hrs.	1 ½ Hrs.