Course Specification 2015/2016
For the Medical Physiology (second year)

Faculty : Medicine
Department : Medical Physiology

Course Specification

Programme(s) on which the course is given : M.B.B.Ch program
Department offering the course : Department of Medical Physiology
Academic year / level : 2nd year
Date of specification approval : 29/11/2015

A- Basic information

Title: Medical Physiology Code: PSL.2
Lecture: 150 Tutorial: Practical 60 Total: 210

B- Professional Information

1 - Overall Aims of Course

The overall aim of the course is to provide the students with the basic knowledge of physiology and develop several practical skills related to experimental work through training on several basic medical skills.

2 – Intended Learning Outcomes of Course (ILOs)

A - Knowledge and Understanding:

By the end of the course, students should be able to:

A1- Identify the different components of CNS and role of each
A2- Describe renal structure and explain functions of different parts of the nephron
A3-Identify endocrinal glands and identify their functions, their regulation and homeostatic roles, discuss male and female reproductive function
A4-Identify the special senses and explain the physiological anatomy of each sense
A5- Explain the types of metabolic reactions, thermogenesis, food intake and their alteration during muscular exercise
A6-Discuss different components of digestive system and its role in food ingestion, digestion, absorption and excretion

B- Intellectual Skills:

By the end of the course, students should be able to:

B1- Integrate facts about function of different organs sub serving the homeostasis.as CNS, kidney, digestive system and endocrine gland
B2- Solve medical problems on pathophysiological bases related to diagnosis and treatment of physiological problems as: PH disturbance, fluid and electrolytes disturbances, fever, hypothermia and sensory disturbances

C-Professional and Practical Skills:

By the end of the course, students should be able to:

C1 Examine sensory function of CNS
C2 - Elicit tendon jerk
C3- Elicit superficial reflexes
C4- Demonstrate small intestinal motility in isolated small intestinal segment of rabbit
C5-Determine visual field
C6-Determine visual acuity
C7- Determine colour vision
C8- Elicit light reflex and general reflexes

C9- Examine hearing acuity
C10- Compute renal clearance to study the kidney function
C11- Measure body temperature
C12- Perform pregnancy test

D- General and Transferable Skills:

By the end of the course, students should be able to:

D1. Adopt principles of the lifelong learning needs of the medical profession.
D2 Present information clearly in written, electronic and oral forms
D3 Work effectively within a team

3 – Contents

Topic	No. of hours	Lecture	Practical
1- Central Nervous System	**68**	**46**	**22**
1. Basic organization and functions of the central nervous system.		2 hour	
2. The sensory system, and the sensory receptors.		2 hours	
3. Sensations, and Neural coding of sensory information.		2 hours	
4. Tactile sensations, Proprioceptive sensations, and Role of the cerebral cortex in somatic mechanoreceptive sensation.		3 hours	
The sense of touch.			6 hours
Proprioceptive sensations.			
Role of the cerebral cortex in somatic mechanoreceptive sensation.			
5. Pain sensation, Pain Control System, and Headache.		3 hours	2 hours
Pain sensation.			
Pain Control System.			
Headache.		2 hour	2 hours
6. Thermal sensation.		4 hours	
7. Synapses of the CNS.			
Chemical synapses.			
Synaptic transmission.			
Postsynaptic receptors.			
Postsynaptic potentials.			
Presynaptic inhibition.			
Neurotransmitters in Central Nervous System			
The small-molecule neurotransmitters.			
Neuropeptides.			
8. Motor functions of the spinal cord.			
Functional classification of Spinal reflexes.		4 hours	
Spinal reflex arc.			8 hours
Afferent neurons.			
Interneurons.			
Efferent neurons.			
The withdrawal reflexes.			
General properties of polysynaptic somatic spinal reflexes.			
The muscle stretch reflex.			
Properties of stretch reflex.			
Inverse stretch reflex.			
Skeletal muscle tone.			

The tendon jerks.			
9. The descending motor system			
The corticospinal tract.		2 hours	
The rubrospinal Tract.			
The reticulospinal tracts.			
The tectospinal tract.			
The cerebral cortical motor areas.			
10. Lower motor neuron lesions, Upper motor neuron lesions, and Spinal Cord lesions.			
Lower motor neuron lesions.		4 hours	4 hours
Upper motor neuron lesions.			
Spinal Cord lesions.			
Complete transection of the spinal cord.			
Hemisection of the spinal cord.			
11. The vestibular apparatus.			
The semicircular canals.			
The Utricle and Saccule.		2 hours	
Vestibular hair cells.			
Functions and Mechanism of action of vestibular receptors.			
Effects of stimulation of semicircular canals (SCCs).			
12. Postural reflexes.			
Classification.		2 hours	
Static reflexes.			
Kinetic reflexes.			
13. The thalamus, and the Reticular Activating System.			
The Thalamus.			
Functional Classification of thalamic nuclei.		3 hours	
Thalamic Functions			
The reticular activating system			
14. The basal ganglia.			
Nuclei of the Basal Ganglia.			
Neural connections.		2 hours	
Functional Pathways in Basal Ganglia.			
Functions of the Basal Ganglia.			
Disorders of the Basal Ganglia.			
15. The cerebellum:			
Functional Divisions.		2 hours	
Neural Connections.			
Functions of the Cerebellum.			
Clinical disorders of the cerebellum.			
16. The Hypothalamus, and the Limbic System.			
The Hypothalamus.		3 hours	
Hypothalamic nuclei.			
Hypothalamic functions.			
The limbic system.			
Components.			
Neural Connections.			
Functions.			
17. The cerebral cortex.		4 hours	
Electrical activity of the brain.			
Electroencephalogram.			

Sleep. Functional Areas of the Cerebral Cortex. The cerebral cortical association areas. The parieto-occipito-temporal association area. The prefrontal association area. Neurophysiological basis of language. Role of the cerebral cortex in Learning and Memory.			
<u>2- Kidney</u>	**34**	**26**	**8**
The overall kidney functions.		1 hour	
Nephron.		1 hour	
Juxtaglomerular apparatus.		1 hour	
Renal blood flow RBF.		1 hour	
Glomerular filtration.		1 hour	
Glomerular filtration rate.		1 hour	
Methods of studying renal physiology		1 hour	2 hours
Application and use of clearance methods. - Measurement of GFR. - Measurement of RBF. - Clearance ratio or fraction excretion. -Utilization of clearance methods for studying the transport maximum (Tm) of renal tubules.		4 hours	4 hours
Tubular function * General factors affecting tubular transport. * Proximal tubule. * Loop of Henle. * Distal segment of the nephron.		2 hours	
Renal handing of water.		2 hours	2 hours
Control of body fluid osmolarity (water balance).		2 hours	
Regulation of sodium excretion & extracellular fluid volume.		2 hours	
Diuresis and diuretics.		1 hours	
Renal handling of K^{+}, Ca^{+2}, mg^{+2}, and phosphate.		2 hours	
Role of the kidney in acid - base balance.		2 hours	
Applied physiology		1 hour	
Micturition		1 hour	
<u>3- Endocrine</u>	**28**	**24**	**4**
1. Introduction.		2 hours	
2. The pituitary gland (hypophysis cerebri). a) Anterior lobe (adenohypophysis). b) Posterior lobe (Neurohypophysis).		4 hours	
3. The thyroid gland.		2 hours	
4. The parathyroid glands.		2 hour	
5. Endocrine regulation of Ca^{++} and PO_4 metabolism.		2 hour	
6. The adrenal (or suprarenal glands). a) Adrenal cortex. b) Adrenal medulla.		4 hours	
7. Hormones regulating blood glucose level.			
8. The reproductive system.			
a) Male reproductive functions.		2 hours	
b) Female reproductive functions.		6 hours	4 hours
<u>4- Special senses</u>	**30**	**16**	**14**
Physiology of vision		6 hours	

Physiological anatomy of the eye. * Extraocular structure * Eye ball			
The refractive media of the eye			2 hours
- The cornea			
- The intraocular fluids			
* The aqueous humour			
* The vitreous humour			
- The uveal tract			
* The iris			2 hours
* Control of papillary diameter			2 hours
# The papillary light reflax			
# Accommodation reflex			
# Size of the pupil during anaesthesia			
- The lens			
* Range and amplitude of accommodation			
* Abnormal conditions of the lens			
* Errors of refraction			
* Contact lenses			
- The retina			
* Histological structure			
* Layers of physiological importance			
* Special areas of the retina			
* Blood supply of the retina			
* Ionic basis of photoreceptor potential			
* Electroretinogram			
* Retinal adaptation			
* Duplicity theory of retinal function			2 hours
* After images and fusion of flickering light by the retina			2 hours
Visual acuity			
Colour vision			
The field of vision			
Binocular vision			
Image formation and on-off phenomenon			
Visual pathway			4 hours
Physiology of hearing			
Introduction		6 hour	
Physiological anatomy of the ear			
- External ear			
- Middle ear			
- Inner ear			
* Functional anatomy of cochlea			
* The basilar membrane			
* Organ of corti			
* Stimulation of hair cells			
* Transmission of sound waves in the cochlea			
* Endocochlear potential			
* Cochlear microphonic potential			
Auditory pathway			
Encoding of auditory information			
Hearing defects			

Methods for measuring acuity of hearing **The chemical sense** **Taste sensation** - Basic taste modalities - Taste threshold **and** intensity discrimination - Taste buds - Mechanism of stimulation of taste buds - Nervous pathways of taste sensation - Taste reflexes - Taste preference and control of diet - Disturbance of taste sensation **Olfactory sensation** - Olfactory mucosa - Stimulation of olfactory receptors - The olfactory pathways - Olfactory threshold and discrimination - Adaptation of olfactory sense - Disturbance of smell sensation		2 hour 2 hour	
5- Metabolism **Energy Metabolism** * Introduction * Metabolism * Energy metabolism * Units of energy * RQ **Metabolic Rate and Thermogenesis** * MR * Basal Metabolic Rate * Thermogensis * SDA * Obligatory thermogensis **Control of Food Intake and Regulation of Energy Stores** * Introduction * Energy stores * Regulatory system for control of food intake * Adiposity signals * Regulation of individual meal size and its integration with energy balance * Obesity * Starvation **Regulation of Body Temperature** * Variation in body temperature * Thermal balance * Physical aspects of heat loss * Physiological regulation of heat exchange * Cutaneous blood flow * Regulation of sweat * Physiological regulation of heat production * Regulation of body temperature * Concept of set-point * Feed back gain	**26**	**18** 3 hours 3 hours 4 hours 5 hours	**8** 4 hours 4 hours

* Neural effector mechanisms when the body exposed to hot and cold * Adaptation to hot environment * Adaptation to cold environment * Pathological states with abnormal temperature regulation * Artificial hypothermia **Physiology of Exercise** * Introduction * Metabolic aspects of exercise * Energy sources * Energy requirements * Recovery of muscle metabolic system after exercise * O_2 debt * Nutrients of exercises RQ studies during exercise * Body heat & temperature during exercise		3 hours	
<u>6- Physiology of Gastro-Intestinal Tract</u> **Introduction** **Regulation of GI function** - Nervous control - Hormonal control (GI hormones) **Salivary secretion** **Mastication** **Deglutition** **Oesophagus** **Stomach** * Nerve supply * Gastric secretion * Mechanism and phases of gastric secretion * Gastric juice. - Cellular mechanism of HCl secretion - Control of HCl secretion. - Function of HCl * Gastric mucosal barrier - Peptic ulcer * Motor function of the stomach * Vomiting * Gastric function tests **Pancreatic secretion** * Nerve supply of pancreas * Composition of pancreatic secretion * Functions of pancreatic juice * Cellular mechanism of $NaHCO_3$ secretion by ductal cells * Control of pancreatic secretion * Tests for pancreatic functions **Liver** * Functions * Liver function tests **Bile secretion** * Composition of hepatic bile * Composition of gallbladder **bile** * Bile salts	**24**	**20** 1 hour 2 hours 1 hours 1 hours 1 hours 1 hours 2 hours 3 hours 1 hours 2 hours	**4**

* Jaundice * Control of bile secretion * Functions of gallbladder * Gallbladder function tests **Small intestine** * Nerve supply * Functions of small intestine * Succus entericus * Absorption * Motor functions of small intestine * Ileocecal valve and sphincter **Large intestine** * Nerve supply * Functions of large intestine * Movements of large intestine * Regulation of colonic motility * Defecation		3 hours 2 hours	4 hours

Course	Outcomes																					
	A1	A2	A3	A4	A5	A6	B1	B2	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	D1	D2	D3
1- **Central Nervous System**																							
1. Basic organization and functions of the central nervous system.	√						√														√	√	√
2. The sensory system, and the sensory receptors.	√						√														√	√	√
3. Sensations, and Neural coding of sensory information.	√						√		√												√	√	√
4. Tactile sensations, Proprioceptive sensations, and Role of the cerebral cortex in somatic mechanoreceptive sensation.	√						√		√												√	√	√
5. Pain sensation, Pain Control System, and Headache.	√						√		√												√	√	√
6. Thermal sensation.	√						√		√												√	√	√
7. Synapses of the CNS.	√						√			√											√	√	√
8. Motor functions of the spinal cord.	√						√		√	√	√										√	√	√
9. The descending motor system	√						√		√	√	√										√	√	√
10. Lower motor neuron lesions, Upper motor neuron lesions, and Spinal Cord lesions.	√						√		√	√	√										√	√	√
11. The vestibular apparatus.	√						√														√	√	√
12. Postural reflexes.	√						√														√	√	√
13. The thalamus, and the Reticular Activating System.	√						√														√	√	√
14. The basal ganglia.	√						√														√	√	√
15. The cerebellum	√						√														√	√	√
16. The Hypothalamus, and the Limbic System.	√						√														√	√	√
17. The cerebral cortex.	√						√														√	√	√
2- Kidney																							
The overall kidney functions.		√					√	√													√	√	√
Nephron.		√					√	√													√	√	√
Juxtaglomerular apparatus.		√					√	√													√	√	√
Renal blood flow RBF.		√					√	√													√	√	√
Glomerular filtration.		√					√	√													√	√	√

Course	Outcomes																						
	A1	A2	A3	A4	A5	A6	B1	B2	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	D1	D2	D3
Glomerular filtration rate.		√					√	√													√	√	√
Methods of studying renal physiology		√					√	√													√	√	√
Application and use of clearance methods.		√					√	√										√			√	√	√
Tubular function		√					√	√													√	√	√
Renal handing of water.		√					√	√													√	√	√
Control of body fluid osmolarity (water balance).		√					√	√													√	√	√
Regulation of sodium excretion & extracellular fluid volume.		√					√	√													√	√	√
Diuresis and diuretics.		√					√	√													√	√	√
Renal handling of K+, Ca+2, mg+2, and phosphate.		√					√	√													√	√	√
Role of the kidney in acid - base balance.		√					√	√													√	√	√
Applied physiology		√					√	√													√	√	√
Micturition		√					√	√													√	√	√
3- ENDOCRINE																							
1. Introduction			√				√														√	√	√
2. The pituitary gland (hypophysis cerebri).			√				√														√	√	√
3. The thyroid gland.			√				√														√	√	√
4. The parathyroid glands.			√				√														√	√	√
5. Endocrine regulation of Ca++ and PO4 metabolism.			√				√														√	√	√
6. The adrenal (or suprarenal glands).			√				√														√	√	√
7. Hormones regulating blood glucose level.			√				√														√	√	√
8. The reproductive system.			√				√													√	√	√	√
4- Special senses																							
1. Physiology of vision				√			√						√	√	√	√					√	√	√
2. Physiology of hearing				√			√										√				√	√	√
3.the chemical sense				√			√														√	√	√
5- Metabolism																							
Energy Metabolism					√		√														√	√	√
Metabolic Rate and Thermogenesis					√		√														√	√	√

Course	Outcomes																					
	A1	A2	A3	A4	A5	A6	B1	B2	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	D1	D2	D3
Control of Food Intake and Regulation of Energy Stores					√		√														√	√	√
Regulation of Body Temperature					√		√												√		√	√	√
Physiology of Exercise					√		√														√	√	√
6-Physiology of Gastro-Intestinal Tract																							
Introduction						√	√														√	√	√
Regulation of GI function						√	√														√	√	√
Salivary secretion						√	√														√	√	√
Mastication						√	√														√	√	√
Deglutition						√	√														√	√	√
Oesophagus						√	√														√	√	√
Stomach						√	√														√	√	√
Pancreatic secretion						√	√														√	√	√
Liver						√	√														√	√	√
Bile secretion						√	√														√	√	√
Small intestine						√	√					√									√	√	√
Large intestine						√	√					√									√	√	√

4 – Teaching and Learning Methods

Teaching Methods	Description
Lectures	Scientific material is presented through : 1- power point presentations 2- Animations & videos
Practical lessons	Each practical class is delivered in the following form : 1- Students are divided into 2 groups in 2 physiological laboratories 2- They have a short lecture to explain the background of the practical lesson (25 minutes) 3- Then each group is divided into small groups under supervision of demonstrators to do the practical part of the section (1 hour). 4- Then they record the data they have noticed in their practical books (20 mintues).
Self learning	PowerPoint presentation prepared by the student

5 – Student Assessment Methods

Method of assessment	Description	To Assess
1- Written examinations	- An exam at the end of the academic year - consist of short Essay Questions in different branches	A1-A2-A3-A4-A5-A6- B1-B2
2- MCQ exams	- 2 exams which are held in January& May	A1-A2-A3-A4-A5-A6- B1-B2
3- Practical examinations	- An exam held by end of the academic year. - Consists of 5 experiments in a form of multi-station	C1-C2-C3-C4--C5-C6-C7-C8-C9-C10-C11-C12
4- Sheet examination	- An exam held by end of the academic year. - Consists of 35 MCQ which are related to the practical classes.	C1-C2-C3-C4--C5-C6-C7-C8-C9-C10-C11-C12
5- Oral examinations	- held by the end of the academic year. - The student is examined by 2 different professors to assess his knowledge in all branches of physiology that was studied.	A1-A2—A3-A4-A5-A6- B1-B2
6- Essay and presentation		D1-D2-D3

Assessment Schedule

-Written Examination 50 % (125 Marks)
-Structured Oral 8 % (20 Marks)
-OSPE 8% (20 Marks)
-Midterrm MCQ 16 % (40 Marks)
- Sheet 14% (35 Marks)
- Log book 2% (5 Marks)
- Essay and presentation 2% (5 Marks)

Total 100% (250 marks)

6 – List of References

6.1- Course Notes	Staff member books & lecture notes
6.2- Essential Books (Text Books)	a) Textbook of Medical Physiology (Guyton & Hall). b) Review of Medical Physiology (William F. Ganong).
6.3- Recommended Books	Physiology (NMS)
6.4- Periodicals, Web Sites, …etc	http:// Advan. Physiology.org

7 – Facilities Required for Teaching and Learning

a) Lecture halls.
b) Audiovisual facilities.
c) Virtual Library including multimedia teaching facilities.
d) Publishing facilities including: Printers, photocopy machines.
e) well-equipped laboratories.
f) Laboratory animals.

Course Coordinator : Dr. Mohammed Adel

Head of Department : Prof. dr. Sabry Mohammed Awad Gad