PEARSO

The materials covered in this book are fundamental topics in Human Physiology or Biology. The main objective of this book is to provide the readers with a logical, succinct and interesting presentation of physiology/biology concepts through exciting and different approaches. Readers are provided with interesting information and facts related to the human body system. The readers are encouraged by the authors to explore their body systems and try grasping the biology concepts in a fun way.



DISCOVERING



Idea & Concept Nazira Zubir

Authors Nazira Zubir Nora Ahmad Haliza Hamzah Kamaril Azlah Teruk

Siti Hajar Abdullah Sani Shafiyyah Solehah Zahari Rositi Mashani Mohd Sani Nor Sa'adah Mohd. Nasohah

Preface

Discovering Your Body System is targeted to a wide range of readers, from the general public to university students. The presentation of the entire content is injected with some fun elements such as colorful figures, diagrams, illustrations, cartoon sketches, fun activities/experiments, photos, tables and misconceptions. These elements are to enhance the effectiveness of the text materials and facilitate the learning process. Readers can try out the simple yet fun activities/experiments with their family and friends to explore the biology concepts.

The writing style is informal and relaxed and the contents are presented with a clear and simple sentences. New terms are carefully defined in a simple explanation. The concept and idea of the book is intended to make the reading materials more appealing and enjoyable to the readers.

The materials covered in this book are fundamental topics in Human Physiology or Biology. The main objective of this book is to provide the readers with a logical, succinct and interesting presentation of physiology/biology concepts through exciting and different approaches. Readers are provided with interesting information and facts related to the human body system. The readers are encouraged by the authors to explore their body systems and try grasping the biology concepts in a fun way.

This book can also act as an important guide and source for different level of students; SPM, STPM, Matriculation, A-level or university students. Students may find this book useful in their process of learning Biology. This may help them to strengthen their understanding and comprehension of some topics in Biology.

Nazira Zubir Nora Ahmad Haliza Hamzah Kamaril Azlah Teruk Siti Hajar Abdullah Sani Shafiyyah Solehah Zahari Rositi Mashani Mohd Sani Nor Sa'adah Mohd Nasohah

DYBS_Prelims.indd 3 11/5/12 12:52 PM

About the Authors



Nazira Zubir is the lead author (Chapters 3 and 5), creator and head of this project. She graduated from Adelaide University, Australia with a B.Sc. (major in Pharmacology & Physiology). She has 15 years of working experience in various fields, including broadcasting, editorial and education. She has been with RTM, TV3, PETROSAINS Sdn. Bhd. (subsidiary of PETRONAS) before joining the

Centre for Foundation Studies, International Islamic University Malaysia (CFSIIUM) in December 2005. She has taught different levels of Biology subjects offered to the students at CFS. She was appointed as Course Coordinator for Biology Department from 2010 to 2012. During her service at CFSIIUM, she has obtained a few awards: Best Teacher Award (CFS Level) in 2010, Exemplary Teacher Award (CFS Level) in 2011 and Best Teacher Award (Sciences, University Level) in 2012.



Nor Sa'adah Mohd Nasohah (author of Chapter 8) is currently Head, Department of Biology at CFSIIUM since 2010. She was appointed as Course Coordinator for the Department of Science from 2009 to 2010. She has been a lecturer at CFS IIUM for eight years and has more than 15 years of teaching experience. She also has experience in teaching at the University of Malaya Foundation Programme

and Ministry of Education Matriculation Programme. She was with the Ministry of Education Matriculation Division until she joined CFSIIUM in 2004. She received her B.Sc. (Hons) and M.Sc. (Plant Tissue Culture and Phytochemistry) qualifications from Universiti Malaya.

DYBS_Prelims.indd 5 11/5/12 12:52 PM



Haliza Hamzah (co-author of Chapters 1 and 9) is a teacher at the Biology Department, CFSIIUM since 2009. She graduated in B.Sc. (Hons) (Zoology), Universiti Malaya. Previously, she worked as a teacher at Kolej Matrikulasi Perak. She has more than ten years of teaching experience. She was one of the authors of the *Biology Matriculation* book. She was appointed as Academic Advisor (Medical

& Dentistry) from 2010 to 2012. Currently, she holds the position of Deputy Head, Biology Department.



Nora Ahmad (co-author of Chapters 1 and 9) is a lecturer at the Biology Department, CFSIIUM since 2007. She earned her degree in B.Sc. (Environmental & Occupational Health) and her postgraduate in Master of Environment from Universiti Putra Malaysia. She has eight years of experience in teaching. She used to teach students of Diploma in Occupational Safety and Health Management (DOSHM) at

CONSIST College. Prior to that, she worked as a tutor at the Department of Community Health, Faculty of Medicine and Health Sciences, UPM. She was appointed as the Laboratory Coordinator (Biology) from 2010 to 2012 and received the Exemplary Teacher Award (CFS Level) in 2011.



Kamaril Azlah Teruk (author of Chapter 6) is a teacher at the Biology Department, CFSIIUM since 2000. She obtained her degree in Bachelor of Science (Biology) from Universiti Putra Malaysia in 1999. She started her teaching career as a Matriculation Biology lecturer (for KPM) at private colleges in 2000. She has shown great interest in using Web Based Application technology and initiated the use of LMS and WIKI

as a hub of documentation in the Department of Biology. Currently, she is a Mahallah's Principal (at student residence) and is active in student activities. At present, she is the leader of the Biology Department Research Team unit and is working on a new project.

DYBS_Prelims.indd 6 11/5/12 12:52 PM



Siti Hajar Abdullah Sani (author of Chapter 4) is a Biology lecturer at CFSIIUM. She holds a B.Sc. in Biomedical Science and M.Sc. in Health Science (Health Education), both from Universiti Kebangsaan Malaysia. She taught Diploma students in Parasitology and Entomology subjects at Kolej Universiti Teknologi & Pengurusan Malaysia, currently known as Management and Science University, for 2 years.

She has eight years of experience in teaching. Currently, she is a Course Coordinator in Biology. At present, she is in the Biology Department Research Team unit and is working on a new project.



Rositi Mashani Mohd Sani (author of Chapter 2) has been teaching at the Biology Department, CFSIIUM since 2005. She received her degree in B.Sc. (Biochemistry) and earned her postgraduate in M.Sc. (Food Science) from Universiti Kebangsaan Malaysia. She has experience in teaching Degree students in Food Science at Management and Science University for 2 years. She is one of the Mahallah's

Fellow (warden at student residence) and is active in student activities. At present, she is one of the Academic Advisors (Pharmacy) which allows her to share her excitement and experiences with the students.



Shafiyyah Solehah Zahari (author of Chapter 7) is a teacher at the Biology Department, CFSIIUM since 2008. She obtained her degree in Bachelor of Biomedical Science from IIUM. She used to teach students of Diploma in Medical Laboratory Technology at PTPL College in Terengganu from 2007 to 2008. She is one of the Mahallah's Fellow (warden at student residence) and is active in

student activities. Her article journal was published in the *Journal of Food Toxicology* entitled "Effect of green and ripe Carica papaya epicarp extracts on wound healing and during pregnancy" in 2008. At present, she is in the Biology Department Research Team unit and is working on a new project. She is currently an Academic Advisor (Medical & Dentistry).

DYBS_Prelims.indd 7 11/5/12 12:52 PM

Contents

1	Locomotion	1
	Vertebrae & Human Endoskeleton	1
	Joints	3
	Muscle Contration and Relaxation	4
	Structure of a Skeletal Muscle	5
	The Sliding Filament Theory (Huxley & Hanson, 1954)	7
	Molecular Structure of Actin and Myosin	7
	Mechanism of a Muscle Contraction	9
	Mechanism of a Muscle Relaxation	11
	Disorders	12
	Diagnosis/Treatment of Diseases	14
2	Digestive System	17
	Digestion	18
	Mouth	19
	Teeth	19
	Tongue	20
	Pharynx and Esophagus	20
	Stomach and Small Intestine	21
	Overview: Digestion Process in the Small Intestine	23
	Absorption in the Small Intestine	23
	The Large Intestine	24
	Accessory Organs in the Digestive System	25
	Pancreas	25
	Liver	25
	Gallbladder	26
	Human Nutritional Requirements	26

DYBS_Prelims.indd 9 11/5/12 12:52 PM

3	Respiratory System	31
	The Human Respiration System	31
	Inhalation and Exhalation	34
	Role of Partial Pressure Gradient	36
	Respiratory Pigment	36
	O ₂ Transport & Bohr Effect	36
	Carbon Dioxide Transport	38
	Control of Breathing	41
	Lung Volume	42
4	Circulatory System	47
	Components of the Circulatory System	49
	General Functions of the Circulatory System Blood	50 51
	Blood Vessels	53
	The Heart	56
	The Cardiac Cycle	57
	Blood Pressure	57 57
	Homeostasis of Blood Pressure	58
	Blood and Circulatory Disorders	59
	Comparison between Cardiovascular and	33
	Lymphatic System	60
5	Inches you of Creations	((
J	Immune System	66
	Nonspecific Defenses	67
	Internal Cellular and Chemical Defenses	67
	How Natural Killer (NK) Cells Cause Apoptosis	71
	Specific Immune Responses	72
	Cells of an Immune Response	74
	Mechanism of a Cell-mediated Immune Response	76
	Mechanism of a Humoral Immune Response	77

DYBS_Prelims.indd 10 11/5/12 12:52 PM

	Diminished Immune Responses	80
	Allergies	80
	Autoimmune Diseases	81
	Immunodeficiency Diseases	82
	How does AIDS Cause Immunosuppression?	82
6	Urinary System	85
	The Components of the Human Urinary System	85
	Kidneys	86
	, Nephron	87
	Urine Formation	88
	The Urine Formation Process	89
	Countercurrent Multiplier System	91
	Regulation of Fluid Retention by ADH	92
	Kidney Failure Treatment	93
7	Nervous System	94
	•	
	Neuron	95
	Stages of Action Potential	97
	Transmission of Impulses	98
	Important Terms of the Nervous System	100
	Synapse Automorphic Names of Synapses	101
	Autonomic Nervous System Reflexes	104
		107
	Addiction: Drug Abuse	110
8	Hormonal Control	113
	Endocrine Glands	113
	Hormones	113
	Classification of Hormones	114
	Coordination of the Endocrine System	115
	Hormonal Mechanism (Action)	118
	Endocrine System Disorder	121

DYBS_Prelims.indd 11 12:52 PM

9	Reproduction and Development	126
	Human Reproductive System: Male	126
	Human Reproductive System: Female	127
	Spermatogenesis and Oogenesis	128
	Role of Hormones in Spermatogenesis	130
	Role of Hormones in Oogenesis (Menstrual Cycle)	132
	Follicular Phase	132
	Follicular Phase (3 days before ovulation)	133
	Luteal Phase	134
	Fertilization	137
	Steps in Fertilization	138
	Human Development	141
	Cleavage	141
	Gastrulation (2nd week)	141
	Extra-embryonic Membrane and Fate of Germ Layers	142
	Organogenesis/Neurulation (3rd week)	144
	Critical Period of Human Development	144
	Parturition/Childbirth	147
	Lactation/Breastfeeding	151
	Roles of Hormones during Pregnancy, Delivery	
	and Lactation	152
	Human Growth	153
	Allometric Growth Pattern	153

DYBS_Prelims.indd 12 11/5/12 12:52 PM