

Physiology

Practical Manual and Logbook of Certification Competencies for MBBS Students

Fourth Edition

This edition of the practical manual has been revised and updated as per the latest Competency Based Undergraduate Curriculum for the Indian Medical Graduate framed and prescribed by the Medical Council of India, now restructured as National Medical Commission.

All the experiments in the manual have been covered under the following three sections.

1. Hematology Experiments
2. Amphibian Experiments
3. Human Experiments

Logbook for Certification of Assessment of Competencies is included as a separate booklet.

Salient Features

- Learning objectives have been added in each practical. This manual has been printed in full color. In the experiment on the use of microscope, color photographs of various interfering objects have been added. Actual photographs of blood cells (WBC and reticulocytes) have been incorporated for easy identification.
- More color photographs have been incorporated in the manual related to the clinical examination of the patient/ normal subject to make the clinical examination easy to understand. The methods and postures shown in these photographs are based on the procedures given in standard international books on clinical methods.
- A new experiment entitled "Clinical examination of higher functions of nervous system" has been incorporated as per the list of Certification of Competencies by MCI.
- Sufficient space has been given for writing observations, calculation, result and discussion in each experiment. About 4-5 blank and ruled pages have been provided at the end of each section to add any extra experiment depending upon the availability of the specific equipment in the department.
- Several expected *viva voce* questions along with their answers have been given at the end of each experiment and space provided in the form of student's notes to write the answers.
- Certification logbook for assessment of 13 competencies in "clinical physiology procedures" has also been given as a separate booklet along with the Manual.

Raj Kapoor MBBS, MD

is currently Professor of Excellence, Department of Physiology, Vardhman Mahavir Medical College (VMMC) and associated Safdarjung Hospital, New Delhi. He is ex-Principal and Director-Professor and Head, Department of Physiology, VMMC. He has been teaching physiology for the last 33 years. Earlier, he has taught at All India Institute of Medical Sciences, New Delhi; Pt BD Sharma PGIMS, Rohtak; and Lady Hardinge Medical College and Smt SK Hospital, New Delhi. During his career he has also served as Assistant Director-General (Medical Education), DGHS, Ministry of Health and Family Welfare, Government of India; and Director, National Medical Library, New Delhi.



He has attended "Sensitization Program for Attitude, Ethics and Communication Module (AETCOM Sensitization Workshop)" conducted by MCI Regional Centre for Medical Education Technologies, Maulana Azad Medical College, New Delhi, held on July 20, 2019, at Regional Centre in Medical Education Technologies at Vardhman Mahavir Medical College, New Delhi; and "Revised Basic Course Workshop in Medical Education Technologies" conducted by MCI Regional Centre for Medical Education Technologies, Maulana Azad Medical College, New Delhi, July 17-19, 2019, at Regional Centre in Medical Education Technologies at Vardhman Mahavir Medical College, New Delhi. He is the author of eight books including this *Manual*. He has published papers in various scientific journals and presented papers at various national and international conferences.

He has been awarded Dev Raj Bajaj Prize for his research article 'Pulmonary diffusing capacity for CO at varying alveolar oxygen tensions and different alveolar volumes'. He has been honored with Prof KP Puthuraya Award for the 'Best Teacher in Physiology 2019' at the 65th National Conference of Association of Physiologists and Pharmacologists of India, Guwahati.



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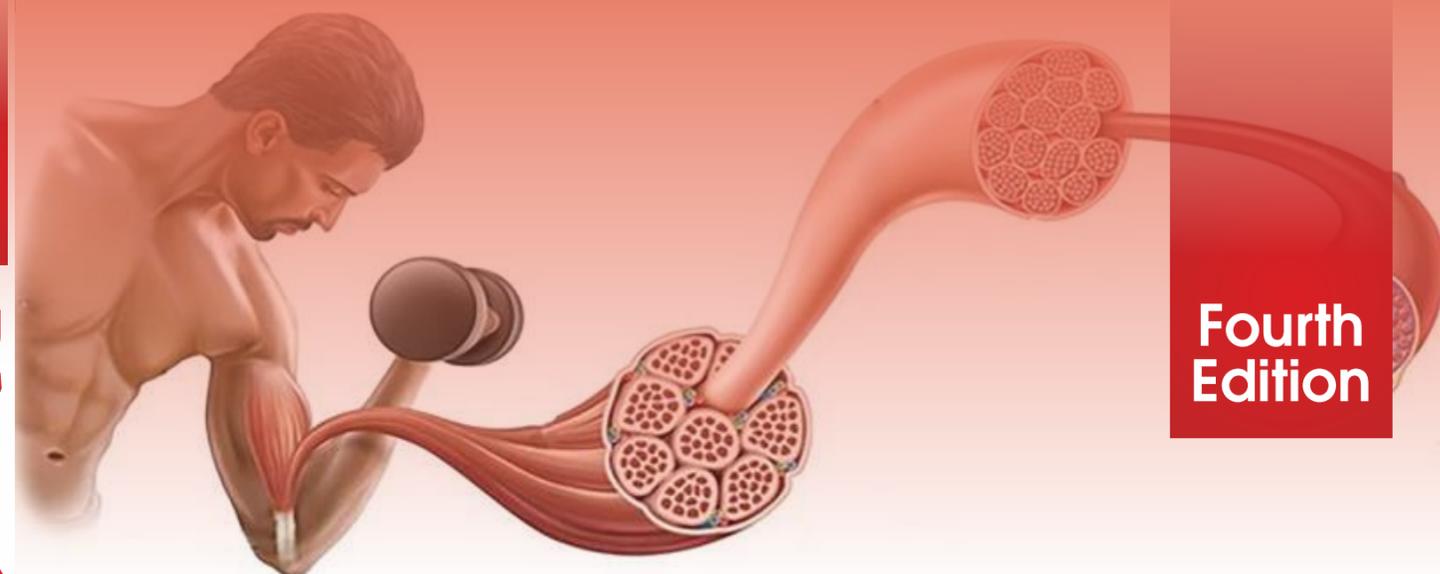


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As per the latest CBME Guidelines | Competency Based Undergraduate Curriculum for the Indian Medical Graduate

Free Logbook of Certification Competencies Inside



Raj Kapoor



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*As per the latest
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for the Indian Medical Graduate*

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Competency Based Undergraduate Curriculum
for the Indian Medical Graduate*

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to
my parents
Smt Lachho Devi & Shri Yad Ram
and my wife
Smt Rajni Bala
my respected teachers
and
my students

Preface to the Fourth Edition

The main aim to bring out the fourth edition of this manual is to do necessary modifications in the experiments on the basis of latest MCI curriculum (CBME for Indian Medical Graduate 2018 and Competency Based Assessment Module for Undergraduate Medical Education 2019).

Learning objectives have been added in each practical. A new experiment has been incorporated as per the list of Certification of Competencies by MCI, "Examination of higher functions of nervous system". *Logbook of Certification Competencies in Physiology for MBBS Students* for 13 competencies has also been incorporated as a separate booklet.

This manual has been printed in four colours. More coloured photographs have been incorporated in the manual related to the clinical examination of the patient/normal subject, to make the clinical examination easy to understand. The methods and postures shown in these photographs are on the basis of procedures given in *Hutchinson's Clinical Methods*.

Each experiment was reassessed during the presentation of practical in the departmental teaching meetings. As per feedback and suggestions from faculty members, senior residents and junior residents, the necessary changes have been made accordingly.

The Mammalian Experiments have been totally removed from the manual to make it appropriate only for undergraduate students. These experiments are now available in my book "*Practical Physiology*". Some new graphs and figures have been added in different experiments for calculation purposes. More space has been provided to write the answers of the questions as Student's notes.

I am thankful to Dr Himani Ahaluwalia, Director, Professor and Head of Department and all the faculty members (Dr Renuka Sharma, Dr Supriya Gupta,

Dr Mansi Bhattacharjee and others); and senior residents of my department, who have helped me a lot in finding out the shortcomings and their solutions.

I am highly thankful to Mr. Navin Kumar Sharma, medical student, who offered himself as a volunteer to the subject for clinical examination. This is his greatness that he came forward for this purpose.

I am grateful to Ms Ritu, laboratory technician of my department; she has allowed me to take her photograph to incorporate in the manual before treatment and after treatment, as she was having anaemia of moderate grade. In addition, she has permitted me to take her blood sample after taking the treatment for anaemia for 15 days, for making the blood film. Photographs of reticulocytes shown in the manual are only because of her kind co-operation. She has also helped me a lot in making the blood film and to take the photographs of blood cells.

I am also thankful to other laboratory technicians Mr Mushir Alam, Mr Sushil Kumar and Mr Kuldeep Kumar for their help in taking the photographs of blood cells.

I am also thankful to CBS Publishers & Distributors. I would like to put on record the sincere efforts of Mr YN Arjuna (Senior Vice President Publishing, Editorial and Publicity), and his team comprising of Ms Ritu Chawla (GM Production), Mr Parmod Kumar (DTP operator) and Mr Rohan (Graphic designer), for bringing out the book in the present form.

I am very thankful to my wife Smt. Rajni Bala who has given me full support in writing this edition of manual.

In spite of the great care taken by me and the editorial team of publishers, some errors might have escaped our notice. I shall appreciate if these errors are brought to my notice.

Raj Kapoor

Preface to the First Edition

Main objectives which I kept in mind at the time of writing this manual are as follows:

1. It should be according to the new curriculum of MCI for first prof. MBBS students.
2. To give more importance to non-invasive human experiments.
3. To give the quantity and quality of practical knowledge which really an undergraduate student requires.
4. To provide them ideal graphs so that they can analyse them and can apply their theoretical knowledge to understand them.
5. To give them almost all the typical records of animal experiments so that unnecessary killing of animals can be avoided.
6. To use the advanced scientific equipments in conducting various experiments and clinical tests.

The duration of first professional MBBS has been decreased from one and a half to one year for the last few years. There is increase in the syllabus because of more and more research is taking place in the basic sciences and clinical field. Day by day advance investigations are coming in the medical field to study the functions of various organs and systems required in making the diagnosis. Because of both the reasons there is a lot of stress of the study on the medical students. Can we decrease some amount of work load on the students without affecting their knowledge of basic aspects of clinical studies? In the manual I have tried my best to keep the balance between the practical workload on the medical student and knowledge required by them. More attention has been given to the clinical physiology and as compared to animal experiments.

We should be having kind attitude towards the experimental animals, rather to sacrifice the animal unnecessarily. We should use the good and typical previous experimental records for study purposes. Here in the manual I have given the copies of typical graphs recorded by myself in my postgraduation training at PGIMS Rohtak and during my senior residency at Lady Hardinge Medical College, New Delhi. Certain graphs which are not available in original, I have drawn them myself keeping in the view of their scientific accuracy. I have also gone through the practical manuals of different medical colleges before writing this manual. The various practical books consulted before writing this manual for clarification of various doubts are—Wintrobe's Clinical Hematology, de Gruchy's Hematology, Practical Physiology by VG Ranade, Practical Physiology by CL Ghai, Hutchison's Clinical Methods, Experimental Physiology by BL Andrews, Experimental Physiology by DT Harris and Fundamental of Experimental Pharmacology by MN Ghosh.

As far as possible we should use modern and upgraded scientific machines and equipments for conducting the different experiments. You will see the differences yourself

when you will see the various graphs and charts given in this manual for your observation and analysis. The diagrams of various blood cells, however, have been drawn by the computer but show almost all features of the typical cells.

Some important viva voce questions have been given at the end of each experiment and intentionally no answer is given with them so that student will try to use his theoretical knowledge to find out the answers. Answers of certain questions which are supposed to be difficult or not easily available have been given at the end of the manual.

I am thankful to my respected teachers Dr (Mrs) KK Mahajan, Professor and Head, Department of Physiology, Himalayan Institute of Medical Sciences, Dehradun, Dr RK Marya, Professor, Department of Physiology in Morisious, Dr (Mrs) Sushma Sood, Professor and Head, Department of Physiology, PGMS Rohtak, Dr (Mrs) Indu Khurana, Associate Professor, Department of Physiology and all other teachers working there for the postgraduate training given to me at Medical College Rohtak, which really brought me at the stage of writing this practical manual with so much confidence.

I am particularly grateful to Dr (Mrs) Shobha Das, Director Professor and Head, Department of Physiology, VM Medical College, New Delhi, for her valuable suggestions and encouragement to write this practical manual.

I am sincerely thankful to Dr (Mrs) Asha Gandhi, Professor and Head, Department of Physiology, Lady Hardinge Medical College, New Delhi for her constant encouragement to me to write this manual. She appreciated my practical skills which was a real encouraging force behind me to write this manual.

I am also not less thankful to Dr (Mrs) Veena Walia (Professor) and Dr (Mrs) Mohini Khullar (Professor) for their time to time help to write this manual.

My thanks are also not less due for Dr (Mrs) Sunita Mondal for her cooperation and help to write this manual.

I am really thankful to Dr Mukul Chandra, Senior Resident for his help in writing the manual and drawing the diagrams.

I am also thankful to other resident doctors and lab staff for their time to time help in writing the manual.

I am thankful to Mr BR Sharma and the team of CBS Publishers for their effort to make this physiology practical manual for undergraduate students. I am also thankful to Mr Ashok for his effort to improve the quality of diagrams and graphs.

My thanks are also due to my wife Mrs Rajni for her help at various steps of writing this manual.

In spite of the great care taken by me and the editorial team of publishers, some errors may have escaped our notice. I shall appreciate if these errors are brought in my notice. I will definitely try to rectify them. Your suggestions and comments are always welcome to improve this manual.

Raj Kapoor

Professor

LIST OF CERTIFIABLE COMPETENCIES

	CARDIOVASCULAR SYSTEM No. of procedures that require certification: 03
1.	PY 5.12 Record pulse and blood pressure at rest in a volunteer.
2.	PY 5.12 Record pulse and blood pressure in a volunteer in different grades of exercise.
3.	PY 5.12 Record pulse and blood pressure in a volunteer during change of posture.
	RESPIRATORY SYSTEM No. of procedures that require certification: 01
4.	PY 6.9 Demonstrate the correct clinical examination of respiratory system in a normal volunteer or simulated environment.
	NEUROPHYSIOLOGY No. of procedures that require certification: 09
5.	PY 10.11 Demonstrate the correct clinical examination of higher functions of nervous system in a normal volunteer or simulated environment.
6.	PY 10.11 Demonstrate the correct clinical examination of motor system in a normal volunteer or simulated environment.
7.	PY 10.11 Demonstrate the correct clinical examination of sensory system in a normal volunteer or simulated environment.
8.	PY 10.11 Demonstrate the correct clinical examination of reflexes in a normal volunteer or simulated environment.
9.	PY 10.11 Demonstrate the correct clinical examination of cranial nerves in a normal volunteer or simulated environment.
10.	PY 10.20 Demonstrate clinical testing of visual acuity, color and field of vision in a normal volunteer or simulated environment
11.	PY 10.20 Demonstrate hearing tests in a normal volunteer or simulated environment.
12.	PY 10.20 Demonstrate testing of taste sensation in a normal volunteer or simulated environment.
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*Note: *Certifiable Competency*