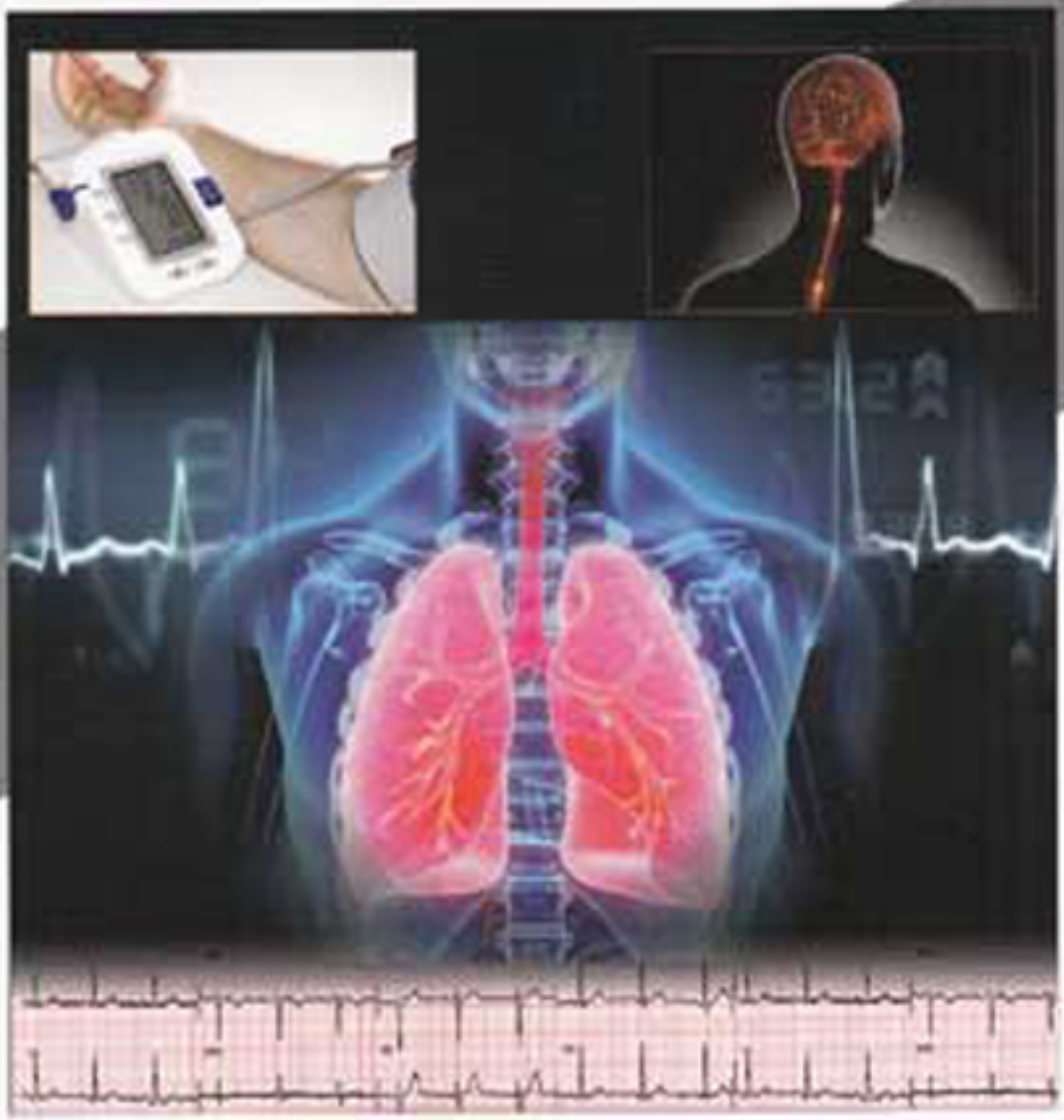
AS PER PCI REGULATIONS
FIRST YEAR B. PHARM. | SEMESTER-I & II

A PRACTICAL BOOK OF

HUMAN ANATOMY AND PHYSIOLOGY

Dr. Shilpa A. Deshpande
Prashant N. Amale
Dr. Niraj S. Vyawahare
Dr. Devendra S. Shirode



NIRALI PRAKASHAN

A Practical Book of

HUMAN ANATOMY AND PHYSIOLOGY

As Per PCI Regulations

FIRST YEAR B. PHARM.

Dr. Shilpa A. Deshpande
M. Pharm., Ph.D.
Assistant Professor
Priyadarshini J. L. College of Pharmacy,
Nagpur.

Dr. Niraj. S. Vyawahare
M. Pharm., Ph.D.
Professor and Principal
Dr. D.Y. Patil Pratishthan's
Dr. D.Y.Patil College of Pharmacy,
Akurdi, Pune.

Prashant N. Amale
M. Pharm.
Assistant Professor
Priyadarshini J. L. College of Pharmacy
Nagpur.

Dr. Devendra S. Shirode
M.Pharm., Ph.D.
Associate Professor
Dr. D.Y. Patil Pratishthan's
Dr. D.Y.Patil College of Pharmacy,
Akurdi, Pune.

. .

Price ₹ 75.00

-

NIRALI PRAKASHAN
ADVANCEMENT OF KNOWLEDGE

N3946

Human Anatomy and Physiology (Practical) **ISBN 978-93-87686-00-7**

First Edition : January 2018

Published By :

NIRALI PRAKASHAN

Abhyudaya Pragati, 1312, Shivaji Nagar,
Off J.M. Road, PUNE – 411005
Tel - (020) 25512336/37/39, Fax - (020) 25511379
Email : niralipune@pragationline.com

Printed By :

STAR COPIERS PVT. LTD.

Kumthekar Road, Sadashiv Peth,
PUNE - 411 030
Tel - (020) 24479201

☞ DISTRIBUTION CENTRES

PUNE

Nirali Prakashan : 119, Budhwar Peth, Jogeshwari Mandir Lane, Pune 411002, Maharashtra
Tel : (020) 2445 2044, 66022708, Fax : (020) 2445 1538
Email : bookorder@pragationline.com, niralilocal@pragationline.com

Nirali Prakashan : S. No. 28/27, Dhyari, Near Pari Company, Pune 411041
Tel : (020) 24690204 Fax : (020) 24690316
Email : dhyari@pragationline.com, bookorder@pragationline.com

MUMBAI

Nirali Prakashan : 385, S.V.P. Road, Rasdhara Co-op. Hsg. Society Ltd.,
Girgaum, Mumbai 400004, Maharashtra
Tel : (022) 2385 6339 / 2386 9976, Fax : (022) 2386 9976
Email : niralimumbai@pragationline.com

☞ DISTRIBUTION BRANCHES

JALGAON

Nirali Prakashan : 34, V. V. Golani Market, Navi Peth, Jalgaon 425001,
Maharashtra, Tel : (0257) 222 0395, Mob : 94234 91860

KOLHAPUR

Nirali Prakashan : New Mahadvar Road, Kedar Plaza, 1st Floor Opp. IDBI Bank
Kolhapur 416 012, Maharashtra. Mob : 9850046155

NAGPUR

Pratibha Book Distributors : Above Maratha Mandir, Shop No. 3, First Floor,
Rani Jhanshi Square, Sitabuldi, Nagpur 440012, Maharashtra
Tel : (0712) 254 7129

DELHI

Nirali Prakashan : 4593/15, Basement, Aggarwal Lane 15, Ansari Road, Daryaganj
Near Times of India Building, New Delhi 110002
Mob : 08505972553

BENGALURU

Pragati Book House : House No. 1, Sanjeevappa Lane, Avenue Road Cross,
Opp. Rice Church, Bengaluru – 560002.
Tel : (080) 64513344, 64513355,Mob : 9880582331, 9845021552
Email:bharatsavla@yahoo.com

CHENNAI

Pragati Books : 9/1, Montieth Road, Behind Taas Mahal, Egmore,
Chennai 600008 Tamil Nadu, Tel : (044) 6518 3535,
Mob : 94440 01782 / 98450 21552 / 98805 82331,
Email : bharatsavla@yahoo.com

Acknowledgement

Authors express their sincere thanks to.....

- Shri. Satish Chaturvedi, Chairman and Smt. Abha Chaturvedi, Secretary; Lokamanya Tilak Janakalyan Shikhan Santha, Nagpur.
- Shri. Satej D. Patil, Chairman, Dr. D. Y. Patil Educational Complex, Akurdi, Pune.
- Col. S. K. Joshi (Retd.), Campus Director, Dr. D. Y. Patil Educational Complex, Akurdi, Pune.
- Dr. D. R. Chaple, Principal; Priyadarshini J. L. College of Pharmacy, Nagpur.
- Dr. Abhijeet, Master Aditya and Master Ajinkya Deshpande, Mrs. Namita Niraj Vyawahare, Mrs. Bhagyashree Devendra Shirode, Shri. Nandkumar & Smt. Tara Amale, and Smt. Radhika Vaibhav Vyavahare.
- Mr. A. V. Kulkarni, Ms. Priyatama Powar, Mr. Santosh Dubal, Mr. Sandesh Talware;

  Dr. D. Y. Patil College of Pharmacy, Akurdi, Pune.
- Mr. Salil Pophali and Ms. Shreejita Hazra; Priyadarshini J. L. College of Pharmacy, Nagpur.
- Shri. Dineshbhai Furia and Shri. Jignesh Furia, Nirali Prakashan, Pune.

For their guidance, suggestions, support, co-operation and timely help.

Authors

Preface

The study of 'Human Anatomy and Physiology' is important to understand Pathophysiology and Pharmacology. In practicing medical sciences, the diagnosis is a next crucial part which determines the course of therapy followed by its outcome. The practicals related to Human Anatomy and Physiology not only provide normal range of various parameters but also give associated abnormalities and its clinical significance. Thus the coordinated knowledge of these streams makes it easy to address any medical complaint.

The present book is a sincere attempt to provide updated yet precise content of the subject with the easy way to teach as well as learn.

The simplified diagrams, tabular compilation and specific information related to clinical significance is provided to further aid the teaching-learning process.

We are hopeful that this book will play major role to develop the required skills in the students which is highly expected in today's era dedicated to skill development. Although we have tried to provide correct information through several proof readings still offer an apology for any textual and printing mistake and invite suggestions for further improvements.

With warm regards.

20th January, 2018 **Authors**

Syllabus

HUMAN ANATOMY AND PHYSIOLOGY - I (Practical)

(Semester - I) (4 Hours/week)

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

***

HUMAN ANATOMY AND PHYSIOLOGY - II (Practical)

(Semester - II) (4 Hours/week)

1. To study the integumentary and special senses using specimen, models, etc.
2. To study the nervous system using specimen, models, etc.
3. To study the endocrine system using specimen, models, etc.
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index.
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyzer.
16. Permanent slides of vital organs and gonads.

***

Contents

***

1. Study of Compound Microscope

Aim: To study the compound microscope.

Requirements:

Compound Microscope, permanent slide (or any other specimen).

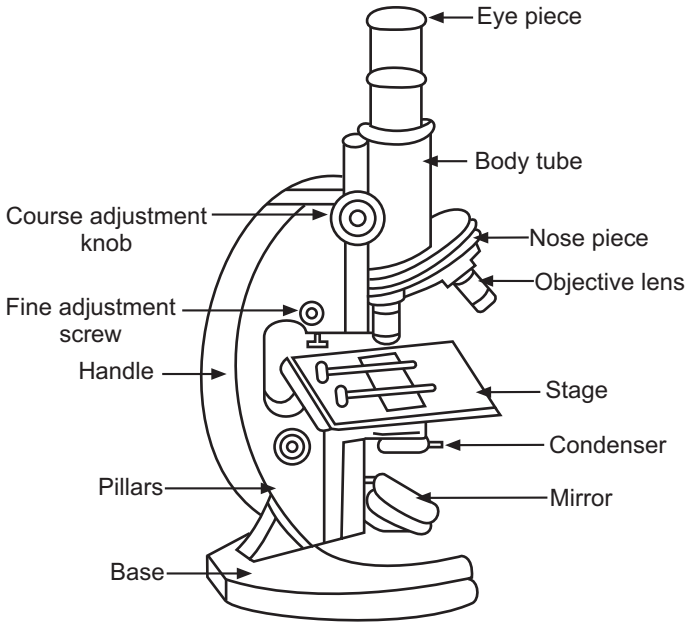


Fig. 1.1: Compound microscope

Theory:

The microscope is one of the most commonly used instruments in medical, paramedical and clinical laboratories. It is used to study Cell Morphology, Histology, Histopathology and Microbiology. A microscope helps us to see microscopic objects that are too small and invisible to the naked eye.

Description of Compound Microscope:

The compound microscope has the following main parts:

1. The supporting system.
2. The focusing system.
3. The optical or magnifying system.

4. The illumination system including:
   (a) Source of light.
   (b) Mirror.
   (c) Condenser.

1. The support system: It is a framework to which various functional units are attached. It consists of the following:

(a) Base: It is a heavy metallic, 'U' shaped or 'horseshoe' shaped base which supports the microscope on work table and provides maximum stability.

(b) Pillars: There are two upright pillars that project up from the base and are attached to the 'C' shaped handle. This allows the microscope to be tilted at a suitable angle for comfortable observation.

(c) Body tube: It is 16-17 cm long cylindrical tube fitted at the upper end of handle which is vertical or at an angle through which light passes via the eye piece to the observer's eye visualizing the image.

(d) The stage: The stage is a square platform with an aperture in its centre and fitted to the limb below the objective lenses. When the slide is placed on it, converging rays of light emerging from the condenser passes through slide and then objective lens into the body tube. It can be either the fixed stage or the mechanical stage. The fixed stage has two clips that hold the slide in position. The mechanical stage has a calibrated metal frame fitted on right side of stage. It has a spring mounted clip to hold the slide and two screw heads to move the slide from side to side, forward and backward. The Vernier scale is also attached to indicate degree of movement.

2. The focusing system: The focusing system consists of coarse and fine adjustment and screw heads are used for raising and lowering body tube for proper focusing the slide. The coarse adjustment moves the focusing system up or down through a large distance via a rack. The fine adjustment works in same way which requires several rotations to move the tube through a small distance. It is employed for accurate focusing.

3. The optical or magnifying system: It consists of body tube, eyepiece and the nosepiece. The body tube is the present between upper end of objective and eyepiece. The eyepiece fits into top of body tube. They can be 5X, 6X, 8X, 10X or 15X. Each eyepiece has two lenses; the eye lens at the top and field lens at the bottom. The field lens collects divergent rays, passes through eye lens to further magnify the image. The nosepiece has two parts; the fixed nosepiece and the revolving nosepiece. The fixed nosepiece holds the revolving nosepiece that carries interchangeable objective lenses. The objective lenses are

spring loaded objectives of different magnifying powers. Different types of objective lenses are low power objective or 10X, high power objective or 45X, oil immersion objectives or 100X and scanning objective 3X.

Magnification: Magnification is the ability to make small objects seen larger, such as making a microscopic organism visible. The objective lenses magnify the images as stated below:

Low power objective (10X) = $10 \times 10 = 100$ times.

High power objective (45X) = $45 \times 10 = 450$ times.

Oil immersion objective (100X) = $100 \times 10 = 1000$ times.

Oil immersion (100X) objective has very small aperture and deep focusing position i.e. 1 mm from the slide. The light rays coming from the slide (denser medium) are refracted by thin layer of air (rarer medium) away from the small aperture of the objective and results in faint image. If some other medium like cedar wood oil, paraffin or glycerin having same refractive index as that of glass is added on the slide, it removes the thin layer of air and forms a continuous medium. This avoids the refraction of light rays and results in sharp image.

2. The illumination system: The microscope will function only when proper illumination or lightning is provided. The illumination system is to provide uniform, soft and bright illumination.

The illumination system consists of:

(a) Source of light: It may be external (natural day light, electric lamp or tube light) or internal (electric in-built light source).

(b) A condenser: It is a system of lenses fitted as short cylinder mounted below the stage.

(c) Mirror: A double sided mirror with one flat side and other concave is located below condenser and can be rotated in all directions. It focuses light rays into a solid cone of light onto the material under study and helps in resolving image.

(d) Iris diaphragm: Iris diaphragm is a thin opaque membranous structure fitted within condenser with a small lever on the side. The lever can adjust size of aperture of diaphragm and allows less or more light falling on slide.

Procedure:

1. Examine the permanent slide/blood film/specimen first with naked eye.
2. Place the microscope on working table in an upright position, and raise the body tube approximately 7-8 cm above the stage. Put the slide on the stage and using the mechanical stage, bring the specimen over the central aperture.

3. Select the low magnification objective (10X).
4. Select and adjust the mirror (plane or concave) so that the light shines on the specimen.
5. Adjust the condenser well down, and partly close the diaphragm to cut down excess light.
6. Looking from the side, and using the coarse adjustment, brings the body tube down so that the low power lens is about 1 cm above the slide. Look into eyepiece and gently raise the tube till the slide comes into focus.
7. Then choose the area of interest for viewing it under higher magnifications.
8. For focusing under high magnification, simply rotate the nosepiece so that the high magnification objective (45X) 'clicks' into position. Raise the condenser to mid position and open the diaphragm to admit enough light. Use fine adjustment as required.
9. For focusing under oil immersion objective (100X), raise the body tube 8-10 cm above the slide. Place a drop of cedar wood oil, paraffin or glycerinon the slide. Looking from the side bring down the objective till it just enters the oil drop. Use other adjustments as required.

QUESTIONS

1. What is the utility of microscope?
2. Enlist different parts of microscope.
3. Differentiate between fixed stage and mechanical stage?
4. What are the components of optical magnifying system?
5. What is oil-immersion objective?

***

2. Determination of Bleeding Time

Aim: To determine bleeding time of own blood by Duke's method.

Requirements:

Sterile disposable needle (26 G), filter papers, stopwatch, cotton swab, 70% alcohol or any other suitable marketed antiseptic.

Principle:

Haemostasis ('haem' means 'blood'; 'stasis' means 'to stop') refers to process of stoppage of bleeding within specified duration (usually 1-5 minutes) after blood vessels are punctured, cut or damaged. It prevents excess loss of blood and thereby avoids further complications. This process involves multiple process like vasoconstriction, platelet plug formation and blood clotting.

Bleeding time is the time interval between the onset of bleeding and spontaneous unassisted stoppage of bleeding. The blood flow stops chiefly because of platelet plug formation and hence, this test is an important *in-vitro* test to check the platelet function. Bleeding time is usually be measured by Duke's method or Ivy method.

Since, platelets are an important regulator of bleeding time alteration in their count is clinically significant.

Procedure:

1. Select the appropriate finger, usually ring finger and clean the tip of the finger using 70% alcohol or any other suitable antiseptic.
2. Get a finger prick using sterile disposable needle (26G) to obtain free flowing blood with minimum pain.
3. Immediately, start the stopwatch and note the time.
4. Absorb or remove the blood drops every 30 seconds by touching puncture site on the piece of filter paper without pressing or squeezing the finger.
5. Number the blood spots one onwards.
6. Note the time when bleeding stops i.e. when there is no trace of blood spot on filter paper.
7. Count the total number of spots and note down number at which there is no trace of blood as endpoint.
8. Express the result in minutes and seconds.

(**Note:** The normal bleeding time is 1-5 minutes).

Observation:

Name:

Age:

Gender:

Date:

Time of pricking: 11:40:00 am.

An example for writing observation is given below.

Sr. No.	Timing of taking blood spot on the filter paper	Bleeding status (Yes/No)
1.	11:40:30 am	Yes
2.	11:41:00 am	Yes
3.	11:41:30 am	Yes
4.	11:42:00 am	Yes
5.	11:42:30 am	No

Result: The bleeding time of own blood was found to be '……' minutes and '……' seconds.

Clinical Significance:

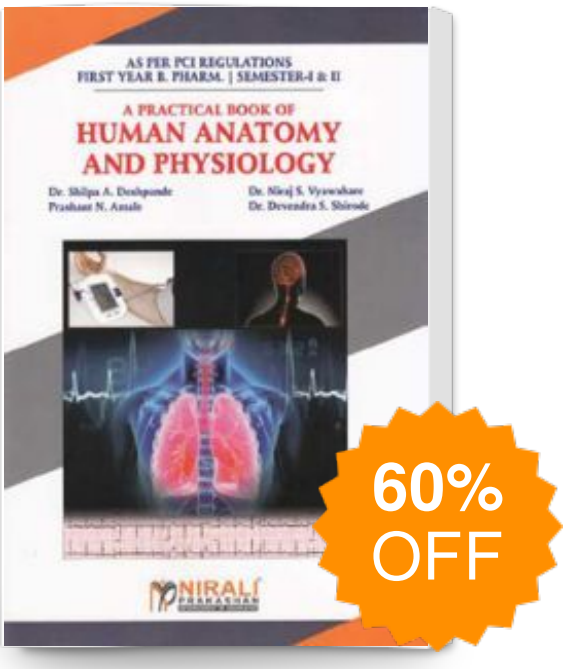
Sr. No.	Bleeding time	Indications/Factors responsible
1.	Prolonged	➢ Platelet defect. ➢ Severe liver disease. ➢ Uremia. ➢ Anti-coagulant drug administration. ➢ Von Willebr and disease (missing or defective clotting protein). ➢ Thrombocytopenia (deficiency of blood platelets). ➢ Disseminated intravascular coagulation (DIC) (blood clots in the small blood vessels). ➢ Glanzmann's thrombasthenia (deficient fibrinogen receptor for platelets) and ➢ Hypofibrinogenemia.

QUESTIONS

1. What do you mean by Haemostasis?
2. Define bleeding time and what is its normal range?
3. Name two methods for determination of bleeding time.
4. Give clinical significance of bleeding time determination.
5. Explain disorders associated with abnormal bleeding time.

***

A Practical Book Of Human Anatomy and Physiology



Publisher : Nirali Prakashan ISBN : 9789387686007

Author : Dr. Shilpa A. Deshpande, Dr. Niraj. S. Vyawahare, Prashant N. Amale, Dr. Devendra S. Shirode