

SCHOOL OF SCIENCE AND TECHNOLOGY

PRACTICAL APPLIED SCIENCE-II

BSN 2307P

PHYSIOLOGY



**BANGLADESH OPEN UNIVERSITY
SCHOOL OF SCIENCE AND TECHNOLOGY**

PRACTICAL APPLIED SCIENCE-II

BSN 2307P

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Preface

Anatomy, Physiology and Pharmacology are very important subject for B. Sc.-in-Nursing students. In distance and open learning system all course books are written in the modular form. All modules for distance learners have some specificity and specialty related to the format of presentation. Like any other modules, here lesson begins with learning objectives and ends with exercises. Learning messages are compiled with easy communicative language. Self-activity questions are very much vital to keep learner on pace in distance mode of education. Self-activities are so designed that the learner will have the base at the text and will have to work a little more for a completed answer. Important messages can easily be given in the self-activity exercises that have not been totally covered in the short text. In fact learners will get the clue for further reading through the self-assessment questions. Most of the portions of the course are self-illustrating but some identified areas have been recorded for audio-visual aid. The assigned teacher will demonstrate practical portion of the course. And marking will be completed at the end of every class. This mark will be added at the final examination. This course has been prepared by active participation of the Course Development Team and has been examined by the referee. In spite of it any suggestion would be highly appreciated regarding further enrichment of the book.

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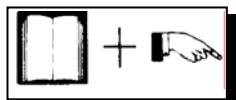
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Notes to Physiology Assignment Supervisor

Learners of distance mode of education less frequently meet their curators and hence they are more self-guided and self-motivated. Drive of need determine their active participation and sustenance to the course. Learners here get minimum scope for assignment and they have to acquire score at the end of the day. So instructions must be perfect and accurate. Please mark the assignments at the end of the day. Please keep one copy of the mark for your record. Every assignment marking has got several components like- *procedure maintenance, promptness in performance, neatness in report writing and perfection of results*. Every aspect is to be evaluated individually. This marking is very important because certain percentage of these markings will be added for the final term-end examination. Your judgment is the best means for career of the learners.

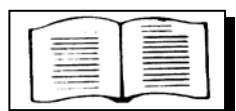
Assignment 1: Identification of Instruments Routinely used in Physiology Laboratory-I



1.1. Learning Objectives

At the end of this assignment you will be able to-

- ◆ identify the equipment's used in physiology laboratory
- ◆ describe the equipment's used
- ◆ set the equipment ready for use
- ◆ describe advantages and precautions with these equipment.



1.2. Principle

Physiology laboratory needs and uses quite a number of common equipment's or apparatus for routine lab procedures. In this assignment learners have to deal with this equipment individually.

1.3. Equipment and Materials Required

1. Microscope (with and without light source) with accessories
2. Centrifuge machine (manual) with accessories
3. Centrifuge machine (electrical) with accessories
4. Colorimeter or photometer with accessories
5. Spirometer with accessories
6. Washing basin and other staining facilities
7. Tray and
8. Staining materials.

1.4. Activity

1. Prepare a checklist for the experiment.
2. Arrange the equipment in the laboratory.
3. Put small size instruments on small individual tray.
4. Draw and label pictures of the instruments.
5. Note the mode of usage of the instrument.

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Activity

6. Write common usage of the apparatus.
7. Write advantages and disadvantages of the particular one.
8. Describes precautions for the particular instrument.
9. Write maintenance of the instruments.
10. Record the checklist.

1.5. Limitation

1. Glass equipment/ apparatus needs careful handling.
2. Apparatus may contain chemicals, corrosives etc.
3. Sharp objects to be cared.
4. Heavy items to be handled properly.
5. Electric or electronic goods to be used after demonstration.

1.6. Observations

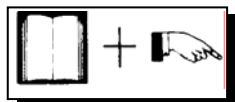
Observation

1. Apparatus are carefully observed and noted.
2. Text to be consulted.
3. Mentor tutor will provide necessary support.

1.7. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill in the checklist for the experiment.

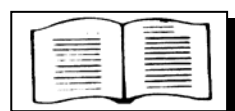
Assignment 2: Identification of Instruments Routinely used in Physiology Laboratory-II



2.1. Learning Objectives

At the end of this assignment you will be able to-

- ◆ identify the equipment used in physiology laboratory
- ◆ describe the equipment used
- ◆ set the equipment ready for use
- ◆ describe advantages or precautions with this equipment.



2.2. Principle

Physiology laboratory needs and uses quite a number of common equipment or apparatus for routine lab procedures. In this assignment learners have to deal with this equipment individually.

2.3. Equipment Required

1. Glass slides slide covers.
2. Glass pipettes- RBC pipettes, WBC pipettes, haemoglobinometer pipettes, serum drawing pipettes etc.
3. Haemocytometer, haemoglobinometer, improved neubauer-counting chamber, ESR tube with stand.
4. Ryle's tube sternal puncture needle.
5. Cedar wood oil for immersion.
6. Blood collecting set- disposable syringe, ligature and lancet and
7. Other essential items.

2.4. Activity

1. Prepare a checklist for the experiment.
2. Arrange the equipment in the laboratory.
3. Put small size instruments on small individual tray.
4. Draw and label pictures of the instruments.
5. Note the mode of usage of the instrument.
6. Write common usage of the apparatus.
7. Write advantages and disadvantages of the particular one.

Physiology

8. Describes precautions for the particular instrument.
9. Write maintenance of the instruments.
10. Record the checklist.

2.5. Limitation

1. Glass equipment/ apparatus need careful handling.
2. Apparatus may contain chemicals, corrosives.
3. Sharp objects to be cared.
4. Heavy items to be handled properly.
5. Electric or electronic goods to be used after demonstration.

Limitation

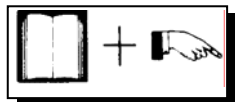
2.6. Observations

1. Apparatus are carefully observed and noted.
2. Text to be consulted.
3. Mentor tutor will provide necessary support.

2.7. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill in the checklist for the experiment.

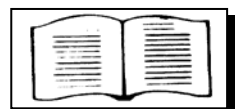
Assignment 3: Preparation of a Sample of Blood for Microscopic Examination



3.1. Learning Objectives

At the end of this assignment you will be able to-

- ◆ understand about blood sampling
- ◆ reproduce the equipment required for blood collection
- ◆ prepare a microscope for blood examination
- ◆ reproduce precautions to be taken during blood sampling.



3.2. Principle

There are different types of examinations with blood. But for the beginners we'll here discuss the examination of blood commonly done under microscope for our routine and regular clinical practice. Blood sample should never be taken from an arm with infusion or transfusion. A dry disposable syringe should be used for drawing blood. Test tubes used for retaining blood after collection should be labeled correctly and should be of 10-cm length at least.

3.3. Site of Blood Collection

1. Capillary blood (Hb, Total RBC, TC, DC, film, parasite identification, platelet count, bleeding time) useful sites –
 - a. Finger tip
 - b. Ear lobe
 - c. Heel.
2. Venous blood (Hb, complete blood count (CBC), film, platelet count, bleeding time, serological and biochemical tests) -
 - a. Antecubital vein
 - b. Vein on dorsum of hand.

3.4. Equipment Required

1. Microscope with accessories
2. Glass slides
3. Glass equipment's
4. Blood collecting set- disposable syringe, ligature and lancet
5. Washing basin and other staining facilities
6. Cedar oil for immersion
7. Tray.

3.5. Activity

Activity

1. Prepare a checklist for the experiment.
2. Prepare the patient and the blood collection equipment.
3. Find out the antecubital vein and clean around it.
4. Collect blood with aseptic precaution.
5. Stop bleeding point by cotton gauze pack.
6. Prepare slides for WBC counts, MP, film study and anything more as requested.
7. Put blood into test tube with anticoagulants.
8. Set for erythrocyte sedimentation rate.
9. Prepare the microscope.
10. Record the checklist.

3.6. Limitation

1. There are anatomical aberrations of the vein course.
2. Veins often slip while pricking with needles.
3. Sharp needle to be used.
4. To avoid any contagious or blood borne disease the syringe and needles must be sterile.
5. There may be oozing of blood from the site of vein puncture.
6. Patient may feel frightened seeing blood drawing from body.
7. Spread of blood borne diseases by accidental prick to doer.

3.7. Observations

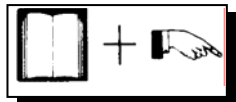
1. Microscope is prepared for examination.
2. Blood is collected properly.
3. Blood drawing point is secured for blood loss.
4. Sample is prepared.
5. Blood is collected in anti-coagulants containing test tube.
6. Blood is set for erythrocyte sedimentation.

3.8. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill up the checklist for the experiment.

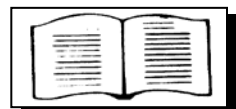
Assignment 4: Preparation of Serum from a Sample of Blood

4.1. Learning Objectives



At the end of this assignment you will be able to-

- ◆ describe set up and functions of a centrifuge machine
- ◆ mention colorimeter or photometer
- ◆ enumerate the equipment necessary for serum preparation and
- ◆ maintenance and storage of serum.



4.2. Principle

Preparation of serum is usually needed for many routine and special types of examinations with blood. Preparation of serum and maintenance of it needs meticulous care and efficient technical know-how.

4.3. Differences Between Plasma and Serum

| Sl.No. | Plasma | Serum |
|--------|---|--|
| 1. | Supernatant fluid of anticoagulant mixed centrifuged blood. | Supernatant fluid of blood after clotting retraction without mixture with anticoagulant. |
| 2. | Contains fibrinogen. | Devoid of fibrinogen. |

4.4. Storage of Serum

1. Serum should be kept in cold environment to delay any chemical changes of it. At 4°C most of the commonly used and required constituents of serum remain stable for up to a week. The period can be prolonged if frozen.
2. Serum should be preserved in the dark because some constituents like bilirubin is rapidly destroyed by light.
3. Serum should be kept in glass containers. Serum is thus preserved well in specimen.

4.5. Equipment Required

1. Centrifuge machine with accessories
2. Glass equipment like pipettes, test tubes etc.
3. Colorimeter/ Photometer with accessories
4. Wash basin and other cleaning facilities

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5. Tray
6. Staining materials.

4.6. Activity

1. Prepare a checklist for this experiment activity.
2. Collect blood from test tubes with anti-coagulants.
3. Set for centrifuge at proper amount and rate of rotation per minute.
4. Isolate serum.
5. Collect serum from centrifuge tube.
6. Insert into colorimeter/ photometer.
7. Record readings from the colorimeter.
8. Calculate for final interpretation.
9. Keep all documents in proper places.
10. Correlate the checklist.

Activity

4.7. Limitation

1. Accidental exposure to patient blood or serum.
2. Measurement by pipettes needs care and accuracy.
3. Accidental sprouting of the samples.
4. Accidental electrical hazards.
5. Ability to read off the colorimetric display and interpretation of the report.
6. Exposure to the optical instruments on part of the learner.

4.8. Observations

1. Centrifuge is prepared for experiment
2. Blood is drawn properly
3. Blood is set for centrifuge
4. Serum is isolated
5. Serum is preserved
6. Serum is set in colorimeter
7. Calorimetric report is properly interpreted.

4.9. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill in the checklist for the experiment.

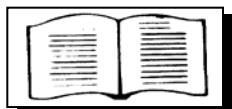
Assignment 5: Examination of a Sample of Blood under Microscope



5.1. Learning Objectives

At the end of this assignment you will be able to-

- ◆ understand about blood sampling
- ◆ identify blood cell type
- ◆ count cell type
- ◆ describe the peripheral blood film.



5.2. Principle

Examination of blood cells under microscope needs much care, experience and excellent clinical knowledge. Eyes will find nothing if the mind does not know about the nature of the expected findings. Comment on blood film is also a very careful interpretation that the laboratory shall have to do. Moreover cells vary in nature, maturity status and shape or size as well.

5.3. Equipment Required

1. Microscope with accessories
2. Glass slides and cover slips
3. Glass equipment
4. Wash basin and other staining facilities
5. Cedar wood oil for immersion
6. Tray
7. Staining materials.

5.4. Activity

1. Prepare a checklist for the experiment.
2. Prepare slides for WBC counts, MP, film study and anything more as requested. Take care for individualized type of slide preparation as per nature of the examination to be done.
3. Stain the films as is directed by the mentor/ supervisor/tutor.
4. Wash and dry the slides and finally use oil for examination.
5. Observe the slide under low and high power.

5.5. Limitation

1. Accidental exposure to patient blood or serum.
2. Identification and counting of cell types needs care and knowledge.
3. Accidental breaking of the sample slides.
4. Accidental electrical hazards.
5. Ability to read immature cells types or abnormal cell morphology and interpretation of the report.
6. Exposure to the optical instruments on part of the learner.

5.6. Observations

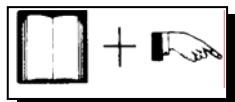
Observation

1. Blood film is prepared.
2. Slides are set properly under microscope.
3. Microscope is handled smoothly under light or moderate magnification of lenses.
4. Report is properly interpreted.

5.7. Conclusions

1. Write your inferences and remarks for this experiment
2. Fill in the checklist for the experiment.

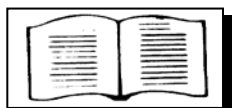
Assignment 6: Examination of a Sample of Stool Under Microscope



6.1. Learning Objectives

At the end of this assignment you will be able to-

- ◆ understand about stool sampling
- ◆ identify stool contents type and nature
- ◆ count stool contaminants type.



6.2. Principle

Stool is the digestion end product containing material. It contains also decomposed matter, microbes and water that comprise the major bulk. Examination of stool under microscope is requested very frequently and repeatedly. Especially in the developing countries, stool examination is of much interest and utility. Stool examination requires proper experience, much care and essential clinical knowledge. Identification of pathogens demands prior theoretical exposure of the person. Stool examination is indicated for diagnosing parasitic infestations, dysenteries, jaundice, cystic diseases of pancreas, diseases of malabsorption syndromes.

6.3. Collection of Sample

1. Must be fresh of any time.
2. Container should be clean only washed with warm water.
3. Should not mix with urine.
4. Drugs affecting results should be discontinued hours before sample collection.
5. Must be examined with 30 minutes after collection.
6. If preservation is needed, *refrigeration* is advisable. Chemicals like *formaline*, *polyvinyl alcohol* may be used for good examinations.

6.4. Equipment Required

1. Microscope with accessories
2. Glass slides and cover slips
3. Glass equipment e.g. stirrer
4. Wash basin and other staining facilities
5. Tray
6. Staining materials.

6.5. Activity

Activity

1. Prepare a checklist for the experiment.
2. Prepare slides for stool film study as requested. Take care for individualized type of slide preparation as per nature of the examination to be done.
3. Prepare unstained (Saline) slide with normal saline solution.
4. Prepare stained slide with iodine solution.
5. Use simple floatation technique for concentration of sample.
6. Make the slides workable under microscope.
7. Observe the slide under low and high power for pathogens.



Exercise: Describe the methods of staining the slide.

6.6. Limitation

1. Accidental spurting of patient stool sample.
2. Identification and counting of pathogen types needs care and knowledge.
3. Accidental breaking of the sample slides.
4. Accidental electrical hazards.
5. Ability to read rare pathogens types or abnormal cell morphology and interpretation of the report.
6. Exposure to the optical instruments on part of the learner.



Exercise: Enumerate commonly found ova in stool in Bangladesh.

6.7. Observations

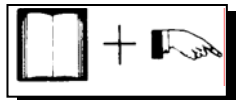
1. Stool film is prepared.
2. Slides are set properly under microscope.
3. Microscope is handled smoothly under light or moderate magnification of lenses.
4. Report is properly interpreted.

6.8. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill in the checklist for the experiment.

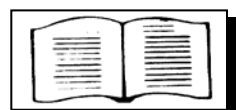
Assignment 7: Examination of a Sample of Urine Under Microscope

7.1. Learning Objectives



At the end of this assignment you will be able to-

- ◆ understand about urine sampling
- ◆ identify urine pathogens type
- ◆ count pathogen concentrations per high power field.



7.2. Principle

Microscopic examination of urine is a day-to-day need for the clinicians. Spectrum of urine examination extends from conception at womb to the pathological needs till complicated ends of the live organism. Urine examination is common and the need is more than any other single tests. Comment on urine film is essential by the nephrologists as well as any other clinicians. Hence the interpretation should be very clear and self-explanatory that the lab has to do. Common indications for urine analysis includes diagnoses of *Diabetes Mellitus*, *UTI*, *Glomerulonephritis*, *Nephrotic syndrome*, *pregnancy determination* and many other disease related to kidney diseases or concentration of fluid or electrolyte components of the body.

7.3. Collection of Urine

1. Mid stream/morning sample is preferred.
2. Collected in a clean, preferably sterile container with lid.
3. Midstream urine sample is requested.
4. Should be examined within 30 minutes of collection. Otherwise to be *preserved* methodically by-
 - i. Refrigeration.
 - ii. Chemical- toluene, formalin (40%), phenol etc.
 - iii. Special preservatives- chloroform, formaldehyde etc.

7.4. Equipment Required

1. Microscope with accessories
2. Glass slides and cover slips
3. Glass equipment
4. Centrifuge machine with equipment

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5. Wash basin and other staining facilities
6. Tray
7. Staining materials.

7.5. Activity

1. Prepare a checklist for the experiment.
2. Centrifuge the urine sample and use the lower part for experiment.
3. Prepare slides for urine film study as requested. Take care for individualized type of slide preparation as per nature of the examination to be done.
4. Make the slides workable under microscope.
5. Observe the slide under low and high power for pathogens.

Activity

7.6. Limitation

1. Accidental exposure to patient's urine.
2. Use of the centrifuge machine needs special care.
3. Identification and counting of cell types needs care and knowledge.
4. Accidental breaking of the sample slides.
5. Accidental electrical hazards.
6. Ability to read different pathogens types, morphology and interpretation of the report.
7. Exposure to the optical instruments on part of the learner.

7.7. Observations

1. Urine is centrifuged properly.
2. Urine film is prepared.
3. Slides are set properly under microscope.
4. Microscope is handled smoothly under light or moderate magnification of lenses.
5. Report is properly interpreted.

7.8. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill in the checklist for the experiment.



Exercise: Describe with diagram of the urinary deposits.

Assignment 8: Observing Patients in the Orthopaedic Ward with Structural Defect: Blood Pressure Measurement

8.1 Learning Objectives



At the end of this assignment you will be able to-

- ◆ describe the sphygmomanometer and stethoscope
- ◆ reproduce the technique of blood pressure measurement
- ◆ problems in blood pressure measurement.



8.2. Principle

Blood pressure is defined as the pressure exerted on the lateral wall of blood vessel by the flowing blood stream inside. It is customary to define 'essential hypertension' as raise of blood pressure stemming from a progressive rise in pressure with age without any known cause. It is clear that factors such as obesity, alcohol consumption, diet and physical inactivity play a major part in the elevation of blood pressure, each operating against a background of varying genetic susceptibility.

8.3. Equipment Required

1. Stethoscope
2. Sphygmomanometer.

8.4. Activity

1. Prepare a checklist for the experiment.
2. Arrange for comfortable sitting of the patient with arm at 45° with the body.
3. Palpate the brachial artery against the lower lateral aspect of the humerus.
4. Check the stethoscope for the diaphragm.
5. Completely deflate the sphygmomanometer cuff. Check for any instrumental error in it.
6. Wrap it around the (right) arm so that lower border of the cuff is 2.5 cm above the elbow joint bent.
7. Inflate the cuff and palpate the pulse to measure systolic pressure. Inflate 20 mm above the palpated pressure. Gradually deflate it to measure diastolic pressure. Record it.

Keep the instrument in safe place for future use

8.6. Limitation

1. Stethoscope does not work well.
2. BP machine is not calibrated.
3. Patient is not relaxed.
4. Personal variation of the record.
5. Irregular pulse rate decreases accuracy.
6. Bradycardia causes missing of the beat detection.
7. Diastolic pressure at muffling sound or cessation of sound.

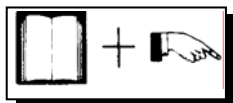
8.7. Observations

1. Systolic and diastolic blood pressure recorded.
2. Pulse pressure calculated.
3. Mean pressure calculated.
4. Report is properly interpreted.

8.8. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill in the checklist for the experiment.
3. Keep the instrument in safe place for maintenance.

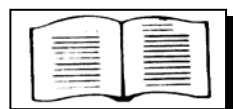
Assignment 9: Observing Patients in the Orthopaedic Ward with Structural Defect: Maintenance of Intake-Output Chart



9.1. Learning Objectives

At the end of this assignment you will be able to-

- ◆ describe importance of intake output chart
- ◆ maintain intake volume log
- ◆ calculate output of body fluids.



9.2. Principle

Human body has the mechanism of excreting out fluids at the end of body metabolism. There are certain diseases where fluid overload is a cause of death. While in others, reduced output signifies the reduced working ability of the renal excretory system. So a balance between intake and output is expected. There are many chronic critical conditions especially in the orthopaedic ward that need evaluation of intake-output of the day.

9.3. Equipment Required

1. Measuring cup, jug/mug and spoon.
2. Bucket or plastic container for more than 5-liter capacity.
3. Container for night soil or vomitus.

9.5. Activity

1. Prepare a checklist for the experiment.
2. Prepare a chart with intake and output headings.
3. Convince the patient and attendant to feed from a measured fixed mug.
4. Keep measured amount of food and drinks for the patient only.
5. Note down every meal and fluid intake amount.
6. Note all body excreta amount after collection.
7. Calculate in the prescribed sheet.
8. Record it.

Keep the instrument in safe place for future use

9.6. Limitation

1. Loss of fluid for non-edible purpose.
2. Intake of fluid by any other person.
3. Passing of stool or urine in some other place.
4. Stool mixed with urine.
5. Missed records.
6. Mug not calibrated properly.

9.7. Observations

1. Solid meal amount recorded.
2. Fruits, snacks amount calculated.
3. Drinks calculated.
4. Urine output measured.
5. Stool quantity recorded.
6. Total amount calculated separately.
7. Report is properly interpreted.

9.8. Conclusions

1. Write your inferences and remarks for this experiment.
2. Fill in the checklist for the experiment.
3. Keep the instrument in safe place for maintenance.

| Sl. No. | Assignment No. | Description |
|---------|----------------|---|
| 1. | 10 | Project: Assistance in spirometric assessment of lung function tests. |
| 2. | 11 | Project: Assistance in puncture of bone marrow. |
| 3. | 12 | Project: Assistance in Ryle's tubes insertion. |
| 4. | 13 | Project: Assistance in dark room refraction test. |
| 5. | 14 | Project: Assistance in audiometry. |
| 6. | 15 | Project: Ten case studies on premature puberty. |