SCHOOL OF SCIENCE AND TECHNOLOGY

PRACTICAL APPLIED SCIENCE-II

BSN 2307P

ANATOMY
PRACTICAL APPLIED SCIENCE-II

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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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#### Physiology

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Assignments:

1. Classify the Drugs in your Ward’s Medicine Cupboard
2. Adrenaline-Action on Blood Pressure
3. Azithromycin-Absorption, Action and Excretion
4. Amoxycillin-Absorption, Action and Excretion
5. Ciprofloxacin-Absorption, Action and Excretion
6. Aspirin-Absorption, Action and Excretion
7. Paracetamol-Absorption, Action and Excretion
8. Diclofenac-Absorption, Action and Excretion
9. Heparin-Absorption, Action and Excretion
10. Warfarin and Dicumarol - Absorption, Action and Excretion
11. Ranitidine-Doses, Indications, Contraindications, Side Effects and Precautions
12. Hyoscine N-Butyl Bromide-Doses, Indications, Contraindications, Side Effects and Precautions
15. Propranolol-Doses, Indications, Contraindications, Side Effects and Precautions
16. Amlodipine-Doses, Indications, Contraindications, Side Effects and Precautions
17. Enalapril-Doses, Indications, Contraindications, Side Effects and Precautions
18. Isosorbide Mono Nitrate-Doses, Indications, Contraindications, Side Effects and Precautions
19. Chlorpheniramine Maleate-Doses, Indications, Contraindications, Side Effects and Precautions
20. Dextromethorphan-Doses, Indications, Contraindications, Side Effects and Precautions
21. Salbutamol-Doses, Indications, Contraindications, Side Effects and Precautions
22. Aminophylline-Doses, Indications, Contraindications, Side Effects and Precautions
Anatomy
Anatomy
Assignment 1: Identify Bones of the Upper Limb

1.1. Learning Objective

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

♦ identify bones of the upper limb
♦ clinical importance of various bones.

1.2. Picture of Upper Limb

![Picture of Upper Limb]

Fig.: Showing different parts of the upper limb.

1.3. The Various Parts of the Upper Limb have been Described in

1.3.1. Clavicle

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

♦ identify clavicle form other bones
♦ describe applied anatomy of clavicle
♦ identify important anatomical point.
Anatomy

Fig.: Different parts and muscle attachment of the clavicle.

Description: See theory Anatomy book.

1.3.2. Applied Anatomy (Clavicle)

- Lies horizontally; and throughout subcutaneous. It is commonly fractured by falling.
- The commonest site of fracture between two curvature of the bone which is the weakest point.

1.3.3. Activity

- Identify clavicle form other bones.
- Hold the clavicle in anatomical position.
- Identify important anatomical point.

1.3.4. Observation: Write down your observation.
Assignment 2: Humerus

2.1. Learning Objectives

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

♦ identify humerus from other bones
♦ describe clavicle importance of humerus.

2.2. Describe the Different Parts and Muscle Attachment of the Humerus

Identification: See textbook.

2.3. Clinical Importance

1. Common sites of fracture at surgical neck, shaft and the supra condylar region. Supra condylar is common in young age group.

2. Three important nerves are passing closely to the humerus. So that liable to injury -
   a. the axillary nerves at the surgical neck .
   b. the radial nerve at the radial groove.
   c. the ulnar nerve behind the medial epicondyle.

Fig.: Showing different parts and muscle attachment of the humerus.

Identification: See textbook.

2.3. Clinical Importance

1. Common sites of fracture at surgical neck, shaft and the supra condylar region. Supra condylar is common in young age group.

2. Three important nerves are passing closely to the humerus. So that liable to injury -
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   b. the radial nerve at the radial groove.
   c. the ulnar nerve behind the medial epicondyle.
Anatomy

2.4. Activity

♦ Identify humerus from other bones.
♦ Hold the humerus in anatomical position.
♦ Identify important anatomical point.

2.5. Observation: Write down your observation.
Assignment 3: The Radius

3.1. Learning Objectives

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

♦ identify radius from other bones
♦ identify important anatomical point
♦ describe uncial importance of radius.

3.3. Clinical Importance

1. Colles’s fracture: when radius fracture just above its lower (app. 2cm) just above the wrist, called colles fracture. It is more common.
2. Smith fracture: It is another fracture just reverse of colles’s fracture.

3.4. Activity

♦ Identify radius from other bones.
♦ Hold the radius in anatomical position.
♦ Identify important anatomical point.

3.5. Observation: Write down your observation.
Assignment 4: The Ulna

4.1. Learning Objective

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

♦ identify ulna from other bones
♦ knowledge on important anatomical point

Figure showing previous assignment.

Description: See the text.

4.2. Clinical Importance

i. The shaft of the ulna may fracture along with radius.
ii. Fracture of olecranon is generally common and caused by a fall.

4.3. Important Structures Lying in Front of Elbow Region

1. Cubital fossa - It is a triangular area in front of elbow. Laterally the brachioradialis muscles, medially pronator teres.
   
   Apex - By the meeting point of the brachioradialis pronator teres.
   Base - An imaginary line joining the two epicondyles of the humerus.

2. Teadon of biceps
3. Terminal part of brachial artery.
4. Proximal part of the radial and ulnar arteries.
5. Median nerve.

4.5. Activity

♦ Identify ulna from other bones.
♦ Hold the ulna in anatomical position.
♦ Identify important anatomical point.

4.6. Observation: Write down your observation.
Assignment 5: The Carpal Bone

5.1. Learning Objective

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

♦ identify carpal bones from other bones
♦ important anatomical point.

5.2. Identification

1. **Scaphoid** - It is a boat shaped and a tubercle on its lateral side.
2. **Lunate** - Is half - moon shaped also called cresentic.
3. **Triquetral** - It is pyramidal in shape and has an oval facet.
4. **Piriform** - Is pea shaped?
5. **Trapezium** - Is quadrangular in shape.
6. **Trapezoid** - Just likes the shoe of a baby.
7. **Capitate** - Largest carpal bone and its head is rounded.
8. **Hamate** - Wedge - shaped with a hook.

5.3. Clinical Anatomy

1. Fracture of the scaphoid is more common caused by a fall on the outstretched hand. So tenderness and swelling in the *anatomical snuff box* and pain on the thumb and index finger.

   *[Anatomical snuff box - It is an important that lies distal to the Styloid process of radius. The radial artery can be palpated within the snuff box]*.
2. **Carpal tunnel syndrome:** It is more common in females between age of 40 to 70 years. Patient complains intermittent attack of pain (burning pain) or pins and needles. This pain is caused by the compression of median nerve in the carpal tunnel.

The carpal tunnel is formed by anterior surface of the carpal bones. It is closed by the flexor retinaculum and tightly packed with the long flexor tendon and their sheath and median nerve.

5.4. Activity

- Identify carpal bone form other bones.
- Hold the carpal bone in anatomical position.
- Identify important anatomical point.

5.6. Observation: Write down your observation.
Assignment 6: The Metacarpal Bones

6.1. Learning Objectives

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

♦ identify metacarpal bones form other bones
♦ important anatomical point.

Fig.: Showing metacarpal bones of the right hand.

Description: See text.

6.2. Clinical Importance

Bennett’s Fracture- Fracture of the base of the first metacarpal.

6.3. Activity

♦ Identify metacarpal bone form other bones.
♦ Hold the metacarpal bones in anatomical position.
♦ Identify important anatomical point.

6.4. Observation: Write down your observation.
Assignment 7: Identify Bones of the Lower Limb

7.1. Learning Objectives

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

♦ identify different parts of lower limb
♦ different part of pelvis
♦ anatomical paint.

The bones of the lower limb are connected with the trunk by pelvic girdles. Each limb consists of thirty-one bones -

1 Hip bone 1 Patella  
1 Femur  7 Tarsal bones  
1 Tibia  5 Metatarsal bones  
1 Fibula  14 Phalanges

The bones are described one by one -

Fig.: Different parts of pelvis.
Assignment 8: Hip Bone

8.1. Learning Objectives

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

♦ identify hip bone.
♦ parts of bone.
♦ difference between hip bone from other bones.

Fig.: Showing different parts of hip bone.

It is an irregular flat bone. It made up of three parts.

♦ Illium - Superiorly.
♦ Pubis - anteroinferiorly.
♦ Ischium - postero- inferiorly.

This three parts as joint to each other at a cup shaped cavity, called acetabulum.
Anatomy

*The acetabulum articulates with the head of the femur to form hip joint.*

*The public parts of the two hip bones uniting anteriorly to form the public symphysis.*

*The public tubercle the lateral ends of the public crest forming an important land make.*

**Activity**

- Identify hipbone form other bones.
- Hold the hipbone in anatomical position.
- Identify important anatomical point.

**Observation:** Write down your observation.
Assignment 9: Femur

9.1. Learning Objectives

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

♦ identify femur from other bones
♦ identify important anatomical point.

The femur is the longest and strongest bone of the body. It has two ends.

1. Upper end.
2. Lower end.
3. And a shaft.

**Upper End:** The upper end of femur includes-

♦ the head
♦ the neck
♦ the greater trochanter
♦ the lesser trochanter
♦ the inter trochanteric line
♦ the inter trochanteric crest.
Anatomy

**Lower End:** is widely expanded. It has to large epicondyles, the intralondylyar notch separates the condyles behind.

*The femur articulates with hipbone, tibia, and the patella. It does not articulate with the fibula.*

**Activity**

♦ Identify femur form other bones.
♦ Hold the femur in anatomical position.
♦ Identify important anatomical point.

**Observation:** Write down your observation.
Assignment 10: Tibia

10.1. Learning Objective

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

♦ identify tibia forms other bones  
♦ identify different parts of bone  
♦ identify important anatomical point.

Fig.: Showing different parts of tibia, fibula and petalla.

The tibia is a long bone, lies medical to the fibula. It has a shaft and upper end and lower end.

Upper End Includes

1. a medial condyle  
2. a lateral condyle  
3. an intracondylar area  
4. a tuberosity.

The shaft of the tibia is prismatic in shape. It has three borders -

♦ anterior,  
♦ medial,  
♦ interosseus.
Anatomy

And three surfaces-

♦ lateral,
♦ medial,
♦ posterior.

**Lower End of the Tibia**

It is slightly expanded. It has five surfaces. It articulates with three bones-the femur, fibula and talus.

*The upper end of the tibia is one of the common sites for acute osteomyelitis.*

**Activity**

♦ Identify tibia form other bones.
♦ Hold the tibia in anatomical position.
♦ Identify important anatomical point.

**Observation:** Write down your observation.
Assignment 11: Fibula

11.1. Learning Objectives

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

- identify fibula from others bones
- describe the different part of bone
- identify important anatomical point.

It is the lateral, thin bone of the leg. It is a long bone. It has two ends and a shaft.

The upper end of the fibula also called head. It articulates with back of the lateral condyle of the tibia.

The lower end is prolonged downward as the lateral malleous.

Fig.: To see previous assignment 3.

Activity

- Identify fibula form other bones.
- Hold the fibula in anatomical position.
- Identify important anatomical point.

Observation: Write down your observation.

Patella

It is a sesamoid bone, triangular in shape and an apex, three borders and two surfaces. It develops in the tendon of the quadriceps femoris. It lies in front of the lower end of the femur about 1 cm above the knee joint.
Assignment 12: Bones of the Foot (Tarsus)

12.1. Learning Objectives

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

♦ identify bones from others bones
♦ describe the different parts bones
♦ identify important anatomical points.

The tarsus is consists of seven tarsal bones, arranged in two rows.

Proximal row- the talus (above the calcaneus below)

Distal row- four tarsal bones lying side by side.

Fig.: Showing different parts of the foot.

From medial to lateral - there are medial cuneiform, the intermediate cuneiform, the lateral cuneiform and the cuboid.

Another, the Navicular bone is interposed between the talus and the three cuneiform bones.

Activity

♦ Identify bones of the foot form other bones.
♦ Hold the bones of the foot in anatomical position.
♦ Identify important anatomical point.

Observation: Write down you observation.
Assignment 13: Metatarsus

13.1. Learning Objectives

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

♦ identify metatarsal form others bones
♦ describe the different parts of bone
♦ identify important anatomical points.

Metatarsus bones - consists of 5 metatarsal bones. It is long bone and has

1. a shaft
2. proximal end
3. distal end.

Phalanges: There are 14 phalanges in each foot. Two for great toe. Three for each of the other toes.

Fig.: To see assignment 4.

Activity

♦ Identify metatarsal bone other bones.
♦ Hold the metatarsal bone in anatomical position.
♦ Identify important anatomical point.

Observation: Write down you observation.
Assignment 14: Identify the Various Parts of the Thorax

14.1. Learning Objectives

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

- bony land marks of thorax
- soft tissue land marks of thorax
- important organs inside the thorax (Heart, Lung).

Fig.: Showing various parts of thorax (Sources – Maemines colors anatomy).

Bony Land Marks

1. Supra Sternal Notch or Jugular Notch

It is felt just above the superior border of the manubrium between the sternal end of the clavicles.

2. Sternal Angle or Angle of Louis

It is a thick transverse ridges about 5 cm below the suprasternal notch. It lies opposite the junction of the manubrium sterni and body of the sternum and at the level of the 2nd costal cartilage.
Sternal Angle is an Important Landmarks for the Following Reasons

i. For counting ribs.
ii. To separates the superior mediastinum from the inferior mediastinum.
iii. It indicates the upper limit of the base of the heart.
iv. Trachea divides into two principal bronchi.
v. Ends of the ascending aorta.
vi. Begins of the descending aorta.

3. Xiphisternat Junction: It is a sharp transverse ridge at the junction of xiphoid process with the body of the sternum. It lies at the level of the upper border of the 9th thoracic vertebra.

4. Ribs: See text.

Soft Tissue Landmarks

1. The nipple - Usually lies in the 4th intercostal space about 4 inches from the mid sternal line. It varies from male to female.
2. Apex beat - It is a palpable and sometimes visible cardiac impulse. It is felt in the left 5th intercostal space. 3 and ½ inches from the mid sternal line.
3. Thrachea - is easily felt in the neck above the suprasternal notch midway between the two clavicles.
4. Mid clavicular or Mammary line - Passes vertically between the mid inguinal point and tip of the 9th costal cartilage.
5. Mid axillary line - passess vertically along the inferior angle of the Scapula.

Instrument Requirement

♦ Tray
♦ Gloves
♦ Dissecting knife

Activity

♦ Identify thorax from other viscera.
♦ Identify important clinical point.
♦ Draw and level the artery, venous and lymphatic supply.

Observation: Write down your observation.
Assignment 15: Heart

15.1. Learning Objective

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

- identify heart
- external features of heart
- valves of the heart
- surface marking of the heart
- surface marking of the cardiac valves
- sites of the auscultatory area.

![Diagram of the heart with various labels](image)

Fig.: Picture shows various part and blood supply of the heart.

Heart is a Strong Muscular Organ

Description of the Heart- See text

Surface Marking of the Heart

**The superior border of the heart** extends from lower border of the 2nd left costal cartilage about ½ inch from the sternal margin to

- upper border of the 3rd right costal cartilage ½ inch from sternal margin.

**The inferior border of the heart** extends the from the lower border of the 6th right costal cartilage, \( \frac{1}{2} \) inch from the sternum -

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- to the left 5th intercostal space 3 ½ inches from the mid sternal line.

The right border extend from the 3rd right costal cartilage ½ inch from the sternal margin and downward to 6th right costal cartilage ½ inch from the sternal margin.

The left border extends from the 2nd left costal cartilage, ½ inch from sternal margin and downward to the left 5th intercostal space, 3 ½ inches from mid sternal line.

Valves of the Heart

Fig.: Valves and conducting system of the heart.

Description: See Text.

Surface Marking of the Cardiac Valve and the Auscultatory Area

Heart sound is produced by closure of the valves of the heart. It can be heard using a stethoscope.

- The first heart sound (lubb) is produced by closure of the atroventricular valves (mitral and tricuspid valves). It is more louder.

Auscultatory area of the first heart sound

Mitral valve (3-cm diameter): Behind the left ½ of the sternum opposite the 4th costal cartilage. It is an oblique line, 3 cm long - (Cardiac apex auscultatory area).

Tricuspid valve (4 cm diameter) behind the right ½ of the sternum opposite the 4th and 5th spaces. (Lower end of the sternum).
Anatomy

**The second heart sound** (dubb) is shorter sound. It is due to closure of the semilunar valves. (Aortic and pulmonary).

**Auscultatory area of the second heart sound**
- **Aortic valves** - 2\(^{nd}\) right costal cartilage near the sternum.
- **Pulmonary valves** - 2\(^{nd}\) left interspace near the sternum.

**Instrument Requirement**
- Tray
- Gloves
- Dissecting knife.

**Activity**
- Identify heart from other viscera.
- Hold the heart in anatomical position.
- Identify important clinical point.
- Draw and level the artery, venous and lymphatic supply.

**Observation:** Write down your observation.
Assignment 16: The Lungs

16.1. Learning Objective

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

♦ identify the lungs
♦ external features of lungs
♦ surface marking of the lungs.

General Description: See text.

Surface Marking of the Lungs

The anterior border of the right lung lying with in the lateral margin of the sternum. Left lung curve laterally to uncover the area of superficial cardiac dullness from 4th costal cartilage medial to the mid clavicular region.

Lower border mid clavicular line at the sixth rib, mid axillary line at the 8th rib lateral border of the creator spine at the 10th rib.

The hilum of each lung -lies behind the 3rd and 4th costal cartilage at the sternal margin and level with T 5, 6 and the 11th costal.

Instrument Required

♦ Tray
♦ Gloves
♦ Dissecting knife.
Anatomy

Activity

♦ Identify lungs from other bones.
♦ Hold the lungs in anatomical position.
♦ Identify important anatomical point.
♦ Draw and level the artery, venous and lymphatic supply.

Observation: Write down your observation.
Assignment 17: Identify the Various Parts of Abdomen

17.1. Learning Objectives

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

♦ identify the various parts of abdomen
♦ identify important anatomical.

Abdomen is body cavity below the chest. It contains various organs, including the liver, spleen, pancreas, stomach, small and large intestines, Kidneys etc. For the help of describe, abdomen is divided into regions by imaginary lines drawn on the abdominal wall - two vertical and two horizontal lines. The vertical lines drawn from the mid point of the clavicle to the midinguinal point, and mid point between the anterior superior iliac spine and the pubic symphysis.

The upper horizontal line is the transpyloric plane, which is run midway between the jugular notch of the sternum and the pubic symphysis. Three central regions from above downwards are the epigastric, umbilical and hypogastric regions.
Anatomy

**Instrument Required**

- Tray
- Gloves
- Dissecting knife.

**Activity**

- Identify the various parts of abdomen.
- Identify important anatomical point.
- Draw and level the artery, venous and lymphatic supply.

**Observation:** Write down your observation.
Anatomy

Assignment 18: Stomach

18.1. Learning Objectives

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

♦ identify stomach
♦ location of the stomach
♦ shape and size of the stomach
♦ external feature of stomach
♦ blood supply and lymphatic drainage
♦ function of stomach
♦ applied anatomy.

![Fig.: Various parts of the stomach](image)

Stomach is a muscular bag. It is the most dilated part of the digestive tube. It is connected above to the lower end of the oesophagus and below to the duodenum. It consists of three parts - fundus, body and pyloric part. It is lined by peritoneum. It lies in the left hypocondrial and epigastric region of the abdomen. It is roughly "J" shaped, when it empties.

It has two opening, two borders (curvatures) and two surfaces.

The upper opening (Cardiac Opening) is the continue with the oesophagus. Behind the 7th costal cartilage, at the level of vertebra T 11.

The lower end of stomach is continues with the duodenum at the level of the lower border at vertebra L1 (transpyloric plane).
It has two curvatures or borders -

i. The lesser curvature is concave, froms the right border of the stomach.
ii. The greater curvature is convex, froms the left border of the stomach.

**Two Surfaces**

i. Anterior.
ii. Posterior.

**Blood supply** - coeliac trunk of the aorta.

**Venous drainage** - portal vein.

**Nerve supply** - vagus nerve and are associated with aorta.

**Function**

1. It acts as reservoir for swallowed food and drink.
2. It begins the digestion of protein.
3. It helps to breakdown food and mixes it with secretion.
4. Gastric juice plays an important role in the digestion of food.
5. HCl destroy many organisms present in the food and drink.

**Instrument Required**

♦ Tray
♦ Gloves
♦ Dissecting knife.

**Activity**

♦ Identify stomach form other viscera.
♦ Hold the stomach in anatomical position.
♦ Identify important anatomical point.
♦ Draw and level the artery, venous and lymphatic supply.

**Observation:** Write down your observation.
Assignment 19: Intestine

19.1. Learning Objectives

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

♦ identify intestine
♦ parts of intestine
♦ function of intestine
♦ blood supply of intestine.

Intestine divided to two parts -

1. Small intestine.
2. Large intestine.

Small Intestine

The small intestine continuous in the pylorus part of the stomach. It consists of the duodenum, jejunum and ileum. It's 5 meters in length.

Duodenum is forming the 25-cm of the small intestine. It is C shaped tube lies behind the peritoneum, of posterior abdominal wall. It has four parts, and these are -
1. Superior,
2. Descending,
3. Horizontal,
4. Ascending.

**Function**

1. It receives gastric contents that are squirted through pylorus.
2. Helps to protect the surface from damage by the acid chyme (Secretion of goblet cell and Brunner’s gland).
3. Act to neutralize the acid (Bile from liver and secretion from pancreas enter by the bile into duodenum). Pancreatic juice and bile both are alkaline.

**Jejunum and Ileum**

The rest of small intestine is the Jejunum and Ileum. It is a hose- pipe like tube, length varies from 4 to 6 meters in the living. The Jejunum is wider and thicker than ileum. Aggregation of lymphoid tissue (Peyer’s Patches) are present in the ileum. But absent in the Jejunum.

**Function**

Most of the processes of digestion and absorption take places in the small intestine.

**Instrument Required**

♦ Tray
♦ Gloves
♦ Dissecting knife.

**Activity**

♦ Identify small intestine form other viscera.
♦ Hold the small intestine in anatomical position.
♦ Identify important anatomical point.
♦ Draw and level the artery, venous and lymphatic supply.

**Observation:** Write down your observation.
Assignment 20: Large Intestine

20.1. Learning Objectives

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

♦ identify various parts of large intestine
♦ identify large intestine from other organs.

It extends from the ileum to the anus. It is about 1.5 m long and is divided in the caecum (with its small out the growth the appendix) the ascending colon, the transverse colon, the descending colon the sigmoid colon, the rectum and anal canal.

Fig.: To see previous assignment.

Function

1. Absorption of water and electrolytes.
2. It acts as storage of undigested material until it can be expelled from the body as feces.
3. Adequate lubrication for passage of its contents by secreting mucus.
4. Protection against bacteria presents in the lumen by solitary lymphatic follicles.

Instrument Required

♦ Tray
♦ Gloves
♦ Dissecting knife.

Activity

♦ Identify large intestine form other viscera.
♦ Hold the large intestine in anatomical position.
♦ Identify important anatomical point.
♦ Draw and level the artery, venous and lymphatic supply.

Observation: Write down your observation.
Assignment 21: Liver

21.1. Learning Objectives

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

♦ identify liver
♦ location of liver
♦ external feature of liver
♦ function of liver
♦ blood supply, venous drainage, lymphatic drainage.

The liver is the largest gland in the body. Situated in the upper right quadrant of the abdominal cavity. The liver is solid mass, raddish, brown in color soft in consistency. It is very friable. It weights about 1500gm, and varies from male to female.

The liver lie under diaphragm occupies the whole of the right hypochondrium, epigastric region of the abdomen and extents to the left hypochondrium upto mid - clavicular line.

External Feature

It is wedge shaped. It has five surfaces -

1. Anterior
2. Posterior
3. Superior
Anatomy

4. Inferior
5. Right.

The liver is divided into two lobes which are right and left lobe. The right lobe is larger than left lobe. By the presence of gall bladder the right lobe is further divided in a quadrate lobe and caudate lobe.

**Blood Supply and Lymph Drainage**

The liver gets arterial blood from common hepatic artery (20%) venous blood is carried to the liver by the portal vein (80%).

The lymphatic drainage of the liver in 5 or 4 nodes that lie in the porta hepatis which are called hepatic nodes.

**Function of Liver**

1. Production and secretion of bile.
2. Metabolism of carbohydrate, fats and proteins.
3. Filtration of the blood removing bacteria and foreign particle.
4. Excretion of drugs, toxins, poisons, bile pigments, cholesterol etc.
5. Storage of glycogen, iron, fat, vitamin A, D and blood.

**Surface Anatomy**

**Upper limit** - as high as the 5th rib in the right mid clavicular line, level with the xiphisternal joint in the mid line and to the 5th intercostal space below the apex of the heart.

**Lower limit** - below the lower part of the right costal margin.

**Instrument Required**

- Tray
- Gloves
- Dissecting knife.

**Activity**

- Identify liver form other viscera.
- Hold the liver in anatomical position.
- Identify important anatomical point.
- Draw and level the artery, venous and lymphatic supply.

**Observation:** Write down your observation.
Assignment 22: The Gall Bladder

22.1. Learning Objectives

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

- identify gall bladder
- describe gall bladder
- blood supply of gall bladder
- function of gall bladder
- composition of bile
- surface anatomy of the gall bladder
- applied anatomy of gall bladder.

The gall-bladder is a pear-shaped, musculo-membranous bag, slate blue in color which is reservoir of bile. It is situated in a fossa on the inferior surface of the right lobe of the liver.

It is 7 to 10 cm (3 to 4 in) long, 3 cm broad at its widest part and its, capacity about 30-60 ml.

It is divided into -

1. the fundus
2. the body
3. the neck.

Fig.: Showing different parts of the gall bladder.
Anatomy

[Cystic Duct: is about 1 ½ inch (4cm) in length and passes from the neck of the gall bladder and joins the hepatic duct. to form bile duct. It convey the bile to the duodenum]

Blood Supply and Lymph Drainage

Arteries: Supplied by cystic artery, branch of right hepatic artery.

Veins- Portal vein.

Lymph drainage- cystic lymph node.

Nerve supply- celiac plexus.

Functions of Gall Bladder

1. Act as a reservoir for bile.
2. Absorption of water and concentration bile.
3. Absorbs small amount of a loose bile salt, cholesterol compound.
4. When food rich in fat enters in to duodenum. Then the gall bladder contacts to liberate a hormone- cholecystokinin-Pancreozymin and helps digestion.

Surface Anatomy- The gall bladder projects slightly from the costal margin at the level of the 9th right costal cartilage.

Applied Anatomy

Cholecystitis - Inflammation of the gall bladder is called cholecystitis.

Murphy’s Sign- When a finger is placed just below the costal margin, at the tip of the 9th costal cartilage, the patient feels sharp pain on inspiration. This is called Murphy's sign.

Cholelithiasis- Stone is gall bladder.

Bile

Bile is a greenish - yellow mucoid, alkaine fluid secreted by the liver cell about 100 ml per day.

The constituents of bile are-

♦ Water
♦ Cholesterol
♦ Bile pigment
♦ Bile salt
♦ Mucin and other substances.

**Instrument Required**

♦ Tray
♦ Gloves
♦ Dissecting knife.

**Activity**

♦ Identify gall bladder form other viscera.
♦ Hold the gall bladder in anatomical position.
♦ Identify important anatomical point.
♦ Draw and level the artery, venous and lymphatic supply.

**Observation:** Write down your observation.
Assignment 23: Pancreas

23.1. Learning Objectives

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

♦ identify pancreas
♦ describe pancreas
♦ blood supply of pancreas
♦ function of pancreas
♦ surface anatomy of pancreas
♦ applied anatomy of pancreas.

Fig.: Showing different parts of the pancreas.

It is a soft lobulated and elongated organ, lies more or less transversely over the posterior abdominal wall, extend from the duodenum to the spleen.

It is 15 to 20 cm long about 3 cm broad and about 2 cm thick. It is weight about 90 gm.

It consists three parts -

1. the head of the pancreas
2. the body of the pancreas
3. the tail of the pancreas.
Blood Supply and Lymphatic Drainage

Arteries- Splenic artery, superior and inferior pancreatico-duodenal vessels.

Vein- portal system.

Lymph- drain to locally adjacent nodes.

Function of Pancreas

It has two functions-

1. **Exocrine function**: It secretes digestive pancreatic juice and helps digestion (fat, protein and carbohydrate).

2. **Endocrine function**: It secretes hormone e.g., insulin, glucagon. Both these hormone are concerned with the control of blood sugar.

Surface Anatomy

At the level of vertebrae L₁ and L₂, lies over the posterior abdominal wall.

Applied Anatomy

Diabetes mellitus - Deficiency of insulin causes Diabetes mellitus (DM)

Instrument Required

♦ Tray
♦ Gloves
♦ Dissecting knife

Activity

♦ Identify pancreas form other viscera.
♦ Hold the pancreas in anatomical position.
♦ Identify important anatomical point.
♦ Draw and level the artery, venous and lymphatic supply.

Observation: Write down your observation.
Assignment 24: Kidney

24.1. Learning Objectives

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

♦ identify kidney
♦ location of kidney
♦ external feature of kidney
♦ function of kidney
♦ surface anatomy.

Fig.: Showing right and left kidney with supra renal gland.

Kidney is one of a pair of excretory organs located in the back of the abdomen, one on each side of the vertebral column, behind the peritoneum.

Each kidney is bean shaped reddish browning color.

It has two poles - Upper and lower poles.

It has two borders - medial and lateral and also two surfaces - anterior and posterior surfaces.

The normal kidney measures about 4×2×1 inch, weight about 4 oz.

The left kidney lies just above the right kidney.
Blood Supply

Artery- renal artery
Vein- renal vein.

**Function:** Formation of Urine-

1. Excrete most of the waste product of metabolism.
2. They play a vital role in controlling the water and electrolyte balance with in the body.

Surface Anatomy

The kidney is situated in the epigastric, hypochondriac, Lumber and umbilical regions.

Vertically they extend from the upper border of vertebra T_{12} to center of the body of vertebra L_{3}.

The transpyloric plane passes through the upper part of the hilum of Rt kidney and lower part of the hilum of the left kidney. The Rt kidney is slightly lower than the left.

Instrument Required

♦ Tray
♦ Gloves
♦ Dissecting knife.

Activity

♦ Identify kidney form other viscera.
♦ Hold the kidney in anatomical position.
♦ Identify important anatomical point.
♦ Draw and level the artery, venous and lymphatic supply.

Observation: Write down your observation.