



JINNAH SINDH MEDICAL UNIVERSITY

STUDY GUIDE

PROGRAM	MBBS-2024
MODULE TITLE	GIT & HEPATOBILIARY-I
ACADEMIC YEAR	2nd Year
INTRODUCTION	This module provides the basis for understanding the structure, gross and molecular functions of GIT & Hepatobiliary system. This module is designed to be linked with GIT & Hepatobiliary system II scheduled in the 3 rd year MBBS where the students will learn about this system's pathologic structure and functions.
RATIONALE	Gastrointestinal-related disorders are extremely common in Pakistan and are a cause of great morbidity and mortality. Diseases like hepatitis and diarrhea are rampant. This module will help students learn not only the structure and functions but will introduce them to the clinical aspects of related disorders so that they can link the basics with the applied aspects.
OUTCOMES	By the end of the module, students of 2 nd year MBBS will be able to correlate the GIT-related structures with functions and biochemical processes
DEPARTMENTS INVOLVED	<ol style="list-style-type: none">1. Anatomy2. Biochemistry3. Physiology
MODULE OBJECTIVES	By the end of the module, the students should be able to:

<p>ANATOMY</p> <p>LECTURES & DEMONSTRATIONS</p>	<p>GROSS ANATOMY</p> <p>1) Introduction & divisions of GIT + abdominal quadrants</p> <ul style="list-style-type: none"> • Describe the divisions and parts of digestive tract • List the abdominal quadrants & regions of GIT <p>2) Anterior Abdominal wall</p> <ul style="list-style-type: none"> • Enumerate the structures forming anterior abdominal wall • Identify the boundaries of anterior abdominal wall • Describe the muscles and fasciae of anterior abdominal wall • Discuss the clinical conditions associated with the anterior abdominal wall <p>3) Inguinal Canal / Inguinal region</p> <ul style="list-style-type: none"> • Describe the extent, boundaries and content of the inguinal canal • Describe the formation of superficial and deep inguinal rings • Describe indirect and direct inguinal hernias • List the different types of hernias <p>4) Esophagus (Abdominal Part), Stomach</p> <ul style="list-style-type: none"> • Explain gross features of abdominal part of esophagus & stomach • List their peritoneal & visceral relations • Explain their blood supply, lymphatic drainage & nerve supply <p>5) Peritoneum [GROSS ANATOMY}</p> <ul style="list-style-type: none"> • Describe the extent of peritoneum horizontally & vertically • Define peritoneal layers, cavity, folds/mesenteries, omentum & ligaments • Explain the attachment and reflection of peritoneum
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- Explain the attachment of peritoneum on liver
- Describe the boundaries of lesser sac

6) Small Intestine & large intestine [GROSS ANATOMY}

- Explain different parts of small and large intestine
- Describe the relations, blood supply and nerve supply and lymphatic drainage of intestine
- Describe the attachment and contents of mesentery
- List the structural differences between small and large intestine
- Discuss the relevant clinical conditions like volvulus & intussusceptions etc.

7) Liver and Gall bladder [GROSS ANATOMY}

- Describe liver with its anatomical positions
- Explain lobes and surfaces of liver and visceral relations and impression.
- Describe the segments of liver
- Describe ligaments attached to the liver
- Discuss the different components of biliary tract
- Explain the parts ,relations and functions of the gallbladder
- Discuss the clinical related to liver and gall bladder

8) Hepatic Portal System

- Identify the veins of GI tract and of hepatic portal system
- Describe the venous drainage of the organs of GI tract and the veins of hepatic portal system
- Describe the clinical importance of the hepatic portal system and its connections

9) Pancreas and Spleen [GROSS ANATOMY}

- Discuss the gross features of different parts of pancreas

- Describe the location & relations, of Pancreas
- List the relations of spleen
- Describe the ligaments attached to spleen
- Describe the arterial supply, venous drainage and nerve supply of pancreas and spleen
- Discuss the clinical relevance of pancreas and spleen

10) Posterior abdominal wall (boundaries, lumbar vertebrae, muscles, fascia)

- Identify the level of vertebrae with respect to the three major orifices in the diaphragm.
- Discuss the location of these orifices with respect to vertebral level and mention the structures passing through it
- Enumerate the structures forming the posterior abdominal wall
- Identify the boundaries of posterior abdominal wall
- Discuss the general characteristics of lumbar vertebrae
- Describe the muscles and fasciae of posterior abdominal wall
- Discuss the clinical conditions associated with the posterior abdominal wall
- including hernias

11) Anal Canal

- Explain the gross anatomical features of rectum and anal canal
- Describe the Ano-rectal junction
- Describe the Nerve supply and blood supply of anal canal
- Describe Ano-rectal fistula, Polyps and diverticulum

NOTE: Anal sphincters (External and internal) will be discussed with pelvis & perineum

12) Abdominal Aorta + blood supply of abdomen

- Describe the course of abdominal aorta
- Enumerate the paired and unpaired branches of abdominal

aorta

- Discuss the arteries which supply the abdominal walls

13) Inferior vena cava + venous drainage of abdomen

- Describe the formation of inferior vena cava
- List the tributaries of inferior vena cava
- Explain the relations of inferior vena cava
- Discuss the clinical conditions associated with inferior vena cava

14) Lymphatic drainage and innervation of abdomen

- Explain the groups of lymph nodes draining the abdomen
- Describe the lymphatic trunks, cistern chili and the thoracic duct.
- Summarize nerve supply of abdominal viscera(GIT)
- Discuss the sympathetic trunk, splanchnic nerves, prevertebral plexus & ganglia supplying the abdomen

15) Surface anatomy of Abdomen

- Identify the bony landmarks of the abdomen & the surface anatomy of Liver & Gall bladder
- Explain the abdominal regions and quadrants
- Locate the abdominal organs in each quadrant
- Discuss the surface anatomy of stomach and spleen
- Describe the variable positions of diaphragm

16) Radiological Anatomy

- Identify various parts of normal GIT on a plain X ray.

HISTOLOGY

1) General Plan of G.I.T + Esophagus

- List the divisions of digestive tract
- Describe the general histological features of GIT
- Describe the histological features of esophagus.

2) Stomach

- Describe the histological features of stomach
- Explain how they can be differentiated from esophagus
- Describe, the microscopic features of gastric glands their constituent cells and secretory product.
- Differentiate cardiac, fundic and pyloric glands

3) Small intestine

- Explain the different layers of small intestine
- Describe the different glands present in the small intestine
- Discuss the cells present in intestinal glands.
- Explain Payers patches
- Differentiate among the parts of small intestine histologically

4) Large intestine

- Describe the histological features of different parts of large intestine
- Enumerate the different layers of the large intestine
- Describe the glands and their cells in different parts of large intestine.
- Explain the difference between small and large intestine

5) Liver and gall bladder

- Explain histology of liver
- Discuss intrahepatic hepatic and portal circulation.

- Describe the general concepts underlying classical hepatic lobule, portal lobule and hepatic acinus.
- Describe the microscopic structure of gall bladder.

6) Pancreas

- Discuss the histological features of Pancreas
- Explain the arrangement of Pancreatic parenchyma & stroma.

EMBRYOLOGY

1) Development of GIT -I

- Describe the divisions of primitive gut
- Enumerate the derivatives of foregut
- Describe the development of foregut
- Describe the clinical aspect of derivatives of foregut
- Enumerate the congenital anomalies of foregut
- Discuss the features of the following congenital anomalies of foregut:

i. Hernias

ii. Esophageal atresia, esophageal stenosis, congenital hypertrophic pyloric stenosis, duodenal stenosis & atresia, anomalies of liver, extra hepatic biliary atresia, annular pancreas, accessory pancreatic tissue, & accessory spleen

2) Development of GIT- II

- List the:
 - development derivatives of primitive gut tube (pharynx. esophagus stomach, intestine)
 - special features associated with common anomalies related to gut including Congenital omphalocele, umbilical hernia, gastroschisis, anomalies of midgut, internal hernia, stenosis,

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atresia of intestine, Mal-rotation of gut, Ileal diverticulum, duplication of intestine, anomalies of hindgut, Hirschsprung disease, imperforate anus, anal stenosis, rectal atresia.

- Describe the derivatives of midgut and hindgut & process of gut rotation
- Explain the formation of greater, lesser omentum and omental bursae
- Discuss the congenital anomalies of gut

3) Development of liver, Gall bladder and Pancreas

- Describe the development of liver
- Discuss the sources of development of hepatocytes and sinusoids.
- Discuss the molecular regulation of liver induction
- Explain the formation of gallbladder & cystic duct
- Enumerate the anomalies of Liver & gallbladder
- Discuss the formation of pancreatic bud and Islet of Langerhans
- Discuss molecular regulation of pancreatic development
- Describe pancreatic anomalies.

BIOCHEMISTRY

LECTURES

DIGESTION & ABSORPTION

1) Digestion & Absorption of Carbohydrates

- List the main digestive enzymes and describe their action on carbohydrate _ Classify dietary carbohydrates with examples
- Explain the significance of the glycemic index
- Describe the importance of dietary fiber
- Discuss the abnormalities due to digestive enzyme deficiency
- Explain the absorption of monosaccharaides by the intestinal mucosal cells

- Discuss the clinical significance of abnormalities of digestion and absorption (e.g. lactose intolerance)

2) Digestion & Absorption of Proteins

- List the various sources of dietary protein
- Discuss the digestion of protein
- Explain the functions of the proteolytic enzymes
- Explain the mechanism of absorption of amino acids
- Discuss the significance of amino acid pool
- Explain the significance of nitrogen balance.
- Discuss the clinical significance of protein allergy, Celiac Sprue and Cystinuria

3) Digestion & Absorption of Lipids

- Define Steatorrhoea
- List causes of Steatorrhoea and constituents of dietary lipids
- Discuss the digestion of lipids
- Explain the role of lipases in lipid digestion
- Discuss the digestion of dietary cholesterol and phospholipids
- Explain the hormonal regulation of lipid digestion
- Discuss the absorption of lipids by the intestinal mucosal cells
- Describe the process of re-synthesis and secretion of lipids by the enterocytes
- Discuss the secretion of chylomicrons by the enterocytes
- Discuss the abnormalities of lipid digestion and absorption with especial reference to cystic fibrosis

METABOLIC PATHWAYS OF CARBOHYDRATES

4) Glycolytic pathway of Carbohydrates Metabolism

- List the reactions of the two stages of glycolysis viz energy

investment and energy generation

- Differentiate between aerobic and anaerobic glycolysis
- Explain the role of insulin in transport of glucose inside the cells
- Explain the hormonal regulation of glycolysis
- Discuss the fate of pyruvate
- Explain the process of glycolysis in RBC's
- Discuss the abnormalities of glycolysis

5) TCA cycle of Carbohydrate metabolism

- Discuss the significance of TCA cycle as an amphibolic pathway
- Discuss the reactions of the TCA cycle and its regulatory steps
- Describe the energy produced from TCA cycle
- Explain the disorders of TCA cycle

6) Metabolism of Glycogen with its disorders

- Explain the structure and functions of glycogen
- Describe the mechanism of glycogen synthesis and its regulation
- Describe the mechanism of glycogenolysis and its regulation
- Discuss the maintenance of blood glucose level
- Explain the various form of glycogen storage diseases

7) Metabolic pathway of Gluconeogenesis

- Describe the mechanism of gluconeogenesis
- List the reactions which are unique to gluconeogenesis
- Describe the regulation of gluconeogenesis
- Explain the Cori cycle

8) Metabolic pathway of HMP Shunt

- Describe the significance of hexose monophosphate shunt
- Describe the oxidative and non-oxidative stages of HMP shunt

- Discuss the enzymes of the HMP shunt and its regulation.
- Explain the abnormalities of the HMP shunt especially G6PD.
- Discuss the significance of reactive oxygen species
- Discuss the functions of NADPH and glutathione

9) Metabolic pathways of Fructose, Galactose & Uronic Acid

- List the sources of fructose
- Discuss the alternative mechanism of monosaccharide metabolism
- Discuss the important enzymes of fructose metabolism
- Explain the metabolic pathway of fructose
- Explain the disorders of fructose metabolism due to enzyme deficiencies
- Discuss the important enzymes of Galactose metabolism
- Explain the metabolic pathway of Galactose metabolism
- Explain the disorders of Galactose metabolism due to enzyme deficiencies
- Explain the uronic acid pathway and its biochemical significance.
- Describe the importance of uronic acid pathway in liver detoxification

BIOLOGICAL OXIDATION

10) Bioenergetics & Biological Oxidation

- List high energy and low energy phosphates
- List the oxido-reductase enzymes
- Define bioenergetics and explain the general laws of thermodynamics
- Define free energy and equilibrium constant
- Describe the coupling of endergonic & exergonic reactions by

high energy intermediates (e.g. ATP)

- Describe the role of ATP as an energy carrier
- Describe biologic oxidation and redox potential

11) Oxidative Phosphorylation & Electron Transport Chain

- List the ion transporters in the inner mitochondrial membrane
- List the genetic defects of oxidative phosphorylation
- Describe the organization of the electron transport chain
- Discuss the functions of each complex of ETC
- Explain the energy currency of the body
- Explain the site and mechanism of synthesis of ATP
- Describe how proton are pumped from the matrix to the intermembrane space
- Discuss the significance of co-enzyme Q and the Q-cycle
- Discuss the inhibitors and uncouplers of ETC and their mechanism of action
- Discuss how electron transport chain releases free energy
- Discuss the generation of proton gradient
- Explain the significance of P.O. Ratio
- Explain Mitchell's chemiosmosis theory of electrochemical gradient
- Explain the glycerophosphate and malate shuttle
- Explain the clinical conditions which inhibit the electron transport chain

BIOCHEMICAL FUNCTIONS OF LIVER

12) Metabolic role of Liver & its detoxification

- Discuss the metabolic, synthetic, excretory, detoxification and storage functions of liver
- List the liver function tests based on the five main functions of the

	<p>liver</p> <ul style="list-style-type: none"> • Explain the normal level of serum bilirubin (total, conjugated and unconjugated), urinary urobilinogen, urinary bilirubin, fecal stercobilinogen in different types of Jaundice • Discuss the importance of serum enzymes in the differential diagnosis of Jaundice (ALT, AST, ALP, LDH, GGT, and 5'-Nucleotidase) • Discuss the importance of albumin, total protein and prothrombin time in diagnosing liver disease <p>13) Degradation of Hemoglobin and Bilirubin Metabolism</p> <ul style="list-style-type: none"> • List the steps of heme degradation to bilirubin • Discuss the role of liver in bilirubin uptake and conjugation • Discuss the secretion of bilirubin in bile • Explain the fate of bilirubin in the intestine and its excretion in urine and stool <p>14) Jaundice and its biochemical investigations</p> <ul style="list-style-type: none"> • Describe the disorders of bilirubin metabolism • Explain the types of bilirubin in the blood • Classify jaundice • Explain the causes with examples and diagnostic investigations of pre-hepatic, hepatocellular & post-hepatic and obstructive jaundice
<p>PHYSIOLOGY</p> <p>LECTURES</p>	<p>1) Overview of Gastrointestinal tract and accessory glands.</p> <ul style="list-style-type: none"> • Describe the characteristics of gastrointestinal wall. • Explain functional types of movements in gastrointestinal tract: Propulsive and Mixing movements. • Describe the Law of gut. • Describe splanchnic circulation and nervous regulation of blood flow.

2) Functions of the smooth muscle and their electrical properties

- Explain the electrical properties of gastrointestinal smooth muscle: Slow wave and Spike potential.
- Describe genesis of BER and its role in GI motility.
- Describe the mechanism of smooth muscle contraction.

3) Neural control of GIT.

- Describe the neural control of Gastrointestinal function: Enteric Nervous system.
- Differentiate between the functions of Myenteric and Meissner's plexus.
- Explain the role of autonomic nervous system on GIT.
- Describe the Gastrointestinal reflexes (gastro-colic, entero-gastric, colono-ileal reflexes).

4) Hormonal control of GIT

- Explain the functions of principal hormones of GIT (Gastrin, Secretin, CCK, GIP, Somatostatin, Ghrelin, Motilin)

5) Physiological anatomy of salivary glands and types of their secretions.

- List the salivary glands and their functions.
- Describe the functions of various salivary glands and their types of secretions.

6) Functions of Saliva, its Composition and Regulation

- Describe the composition of saliva and the mechanism of secretion.
- Explain the nervous regulation of salivary secretion.
- Discuss the effects of dryness of mouth in relation to salivary glands dysfunction.

7) Mastication & Deglutition reflex

- Describe the mechanism of mastication (Chewing).
- Explain the phases of deglutition (Swallowing)
- Describe the importance of gag reflex and effects of its impairment.

8) Upper and lower esophageal sphincter

- Explain the role of upper and lower esophageal sphincter in deglutition reflex.
- Discuss the types of movements in esophagus and motility defects.
- Describe Achalasia of cardia (Megaesophagus)

9) Motor functions of stomach

- Describe the motor functions of stomach: Storage, Mixing and Emptying.
- Explain the regulation of stomach emptying.

10) Gastric secretion (composition, function and regulation)

- Explain the characteristics and secretions of gastric and pyloric glands.
- Describe the mechanism of hydrochloric acid secretion.
- Describe the phases and regulation of gastric secretion.

11) Movements of small and large intestine.

- Describe the movements of small intestine: Segmentation, Peristalsis.
- Explain the movements in colon: Haustrations and Mass movement.
- Describe the effects of autonomic system in modulating intestinal motility.
- Discuss various disorders of small and large intestine: Paralytic ileus, Hirschsprung's disease.

12) Secretions of small and large intestine

- List secretion of different enzymes in small and large intestines
- Describe the regulation of small and large intestinal secretions
- Describe the composition, functions and control of small intestine juice (succus entericus).

13) Defecation Reflex and Diarrhea

- Explain defecation reflex & its nervous regulation.
- Discuss the effect of spinal cord injuries on defecation reflex

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- List various causes of diarrhea: (Enteritis, Psychogenic diarrhea, Ulcerative colitis)

14) Exocrine secretion and functions of Pancreatic enzymes.

- Describe the exocrine role of pancreas and its secretions.
- Explain the composition of pancreatic juice.
- Discuss the role of pancreatic enzymes in food digestion.

15) Secretion of pancreatic juice

- Explain the mechanism of bicarbonate ions secretion.
- Explain the phases of pancreatic secretion.
- Describe the regulation of pancreatic secretion

16) Functions of liver and types of Jaundice

- Define jaundice
- Describe the physiological anatomy and metabolic functions of liver.
- Differentiate between various types of jaundice.

17) Bile secretion (composition, function and regulation)

- List the composition of bile and factors for its release.
- Explain the mechanism of secretion of bile salts and its role in fat digestion and absorption.
- Describe enterohepatic circulation of bile salts.
- List the causes of gallstone formation.

18) Disorders of gastro-intestinal tract.

- Discuss the common disorders of GIT: Vomiting, GERD, Gastritis, Irritable Bowel Syndrome, Malabsorption, Constipation, GI obstruction.

TUTORIALS

ANATOMY

1. Peritoneum

- Describe the extent of peritoneum horizontally & vertically
- Define peritoneal layers, cavity, folds/mesenteries, omentum & ligaments
- Explain the attachment and reflection of peritoneum

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- Explain the attachment of peritoneum on liver
 - Describe the boundaries of lesser sac
- 2. Small Intestine & large intestine**
- Explain different parts of small and large intestine
 - Describe the relations, blood supply and nerve supply and lymphatic drainage of intestine
 - Describe the attachment and contents of mesentery
 - List the structural differences between small and large intestine
 - Discuss the relevant clinical conditions like volvulus & intussusceptions etc.

TUTORIALS

BIOCHEMISTRY

DIGESTION & ABSORPTION

1) Abnormalities of digestion & absorption

- Discuss the clinical importance of abnormalities of digestion & absorption (e.g. Lactose Intolerance)
- Correlate the interpretation of laboratory investigations with relevant clinical conditions

TOPIC: METABOLIC PATHWAYS OF CARBOHYDRATES

2) Disturbances in Carbohydrate Metabolism

- Discuss the clinical importance of disturbances in carbohydrate metabolism (e.g. G6PD deficiency)
- Correlate the interpretation of laboratory investigations with relevant clinical conditions

TOPIC: ELECTRON TRANSPORT CHAIN

3) Disturbances of Electron Transport Chain

- Discuss the clinical importance of disturbances of electron transport chain (e.g. Carbon monoxide poisoning)
- Correlate the interpretation of laboratory investigations with relevant clinical conditions

TOPIC: JAUNDICE

	<p>4) Jaundice and its biochemical investigations</p> <ul style="list-style-type: none"> • Classify Jaundice • List the causes of each type • Correlate the interpretation of laboratory investigations with relevant clinical condition
<p>TUTORIALS PHYSIOLOGY</p>	<p>1. Effects of peptic ulcer</p> <ul style="list-style-type: none"> • Predict the effects of chronic Acid Peptic Diseases on Physiological functions of the body <p>2. Effect of obstruction of common bile duct (CBD)</p> <ul style="list-style-type: none"> • Identify the type of jaundice in the given scenario • Predict the effects of CBD obstruction on Physiological functions of the body
<p>PRACTICALS ANATOMY</p>	<p>1) Esophagus + stomach</p> <ul style="list-style-type: none"> • Identify the: <ul style="list-style-type: none"> ➤ general arrangement of layers in GIT ➤ esophagus and stomach under microscope ➤ characteristic features of each layer of stomach • Describe the light microscopic features of each layer of esophagus • Differentiate among the: <ul style="list-style-type: none"> ➤ 3 histological regions of stomach ➤ histological features of stomach & esophagus <p>2) Small intestine</p> <ul style="list-style-type: none"> • Identify small intestine under light microscope • Discuss the histological features of small intestine <p>3) Liver and gall bladder</p>

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- Identify the following:
 - liver ,its classical hepatic lobule and portal triads
 - layers of gall bladder under light microscope
- Discuss the histological features of both.

4) Pancreas

- Identify the slide under light microscope
- Discuss the histological features of pancreas

5) Large Intestine

- Identify the following:
 - large intestine under microscope
 - appendix on the basis of its distinguished features
 - histological features of anorectal region
- Describe the important histological features of large intestine.
- Differentiate between basic histological features of small and large intestines.

PRACTICALS

BIOCHEMISTRY

DIGESTION & ABSORPTION

1) Serum Glucose Estimation

- List and explain the biochemical investigations done for Diabetes Mellitus
- Outline the method for serum glucose estimation by spectrophotometer
- Estimate the serum glucose levels and give its interpretation
- Correlate the interpretation of laboratory investigations with relevant clinical conditions

JAUNDICE

4) Serum Bilirubin

- Explain the method used to perform Serum Bilirubin by Spectrophotometer
- Estimate serum Bilirubin level (Total, Direct & Indirect Bilirubin)

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	<ul style="list-style-type: none"> • Interpret serum Bilirubin level • Correlate the interpretation of laboratory investigations with relevant clinical <p style="text-align: center;">3) Serum Aminotransferase (ALT)</p> <ul style="list-style-type: none"> • Identify the chemical tests and bio-techniques used to perform serum Aminotransferase • Estimate the serum Aminotransferase level (ALT) • Interpret the serum Aminotransferase level (ALT) • Correlate the interpretation of laboratory investigations with relevant clinical condition <p style="text-align: center;">2) Serum LFT's (Liver function test) profile</p> <ul style="list-style-type: none"> • List and explain the Liver function tests • Identify the chemical tests and bio-techniques used to perform Liver function tests • Interpret the serum Liver function test • Correlate the interpretation of laboratory investigations with relevant clinical condition
SKILLS	<ul style="list-style-type: none"> • Perform abdominal examination on mannequin or normal human subject based on standard protocols
INTERNAL ASSESSMENT	<ul style="list-style-type: none"> • Internal assessment will be according to JSMU policy. • The details of internal assessment will be determined by the respective institutions. • Internal assessment carries 20% weightage in the final, end-of-year examination. • Marks obtained will contribute to Internal Assessment.
FINAL EXAMINATION	<ul style="list-style-type: none"> • Final Annual exam will consist of MCQs (One Correct & One Best) and OSPE (observed + unobserved stations)
COURSE	<ul style="list-style-type: none"> • The module will be evaluated through a feedback form

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EVALUATION

posted on JSMU website