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MODULE 9 L05

Digestive Functions of Liver, Gallbladder and Pancreas

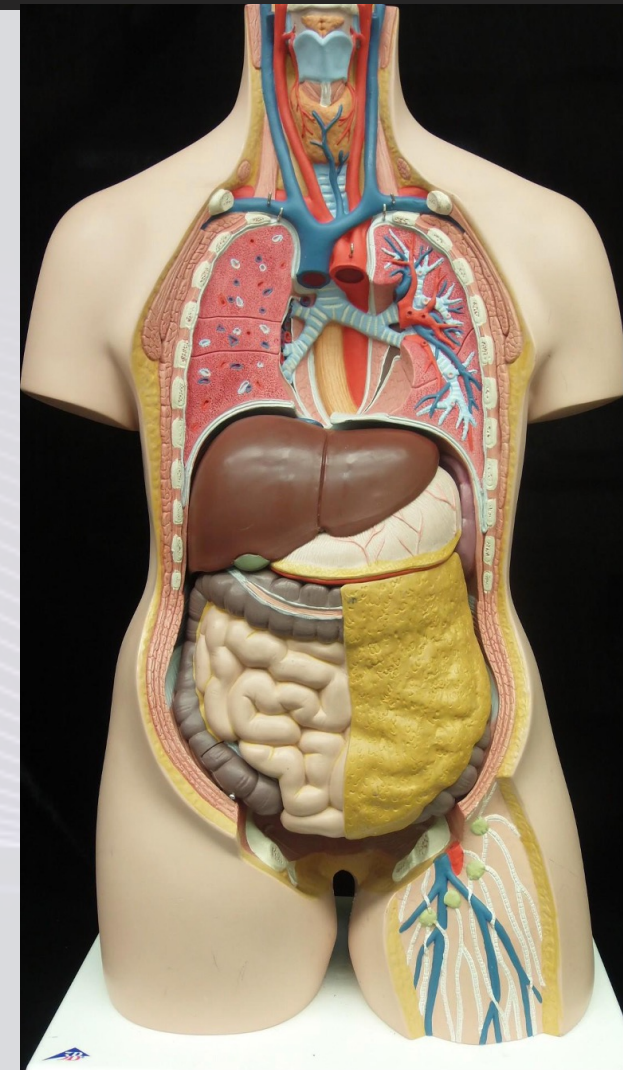
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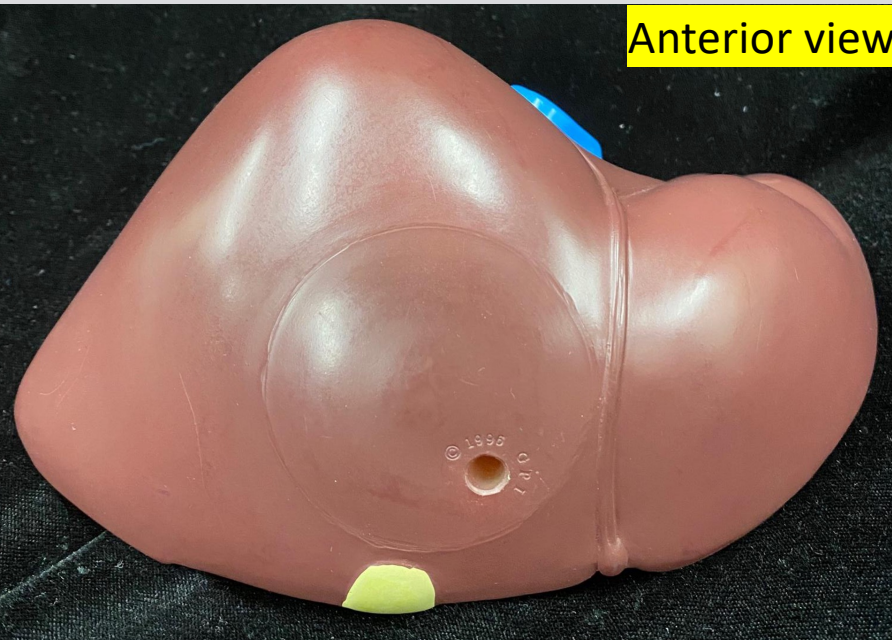
Liver

- Largest visceral organ
- More than 200 different functions
- Essential metabolic and synthetic services
 - A. Metabolic regulation
 - B. Hematological regulation
 - C. Bile synthesis and secretion
- Other functions:
 - ❖ Storage of glycogen and lipid reserves
 - ❖ Maintenance of normal blood glucose, amino acid, and fatty acid concentrations
 - ❖ Inactivation of toxins
 - ❖ Storage of iron reserves
 - ❖ Synthesis of the inactive hormone angiotensinogen

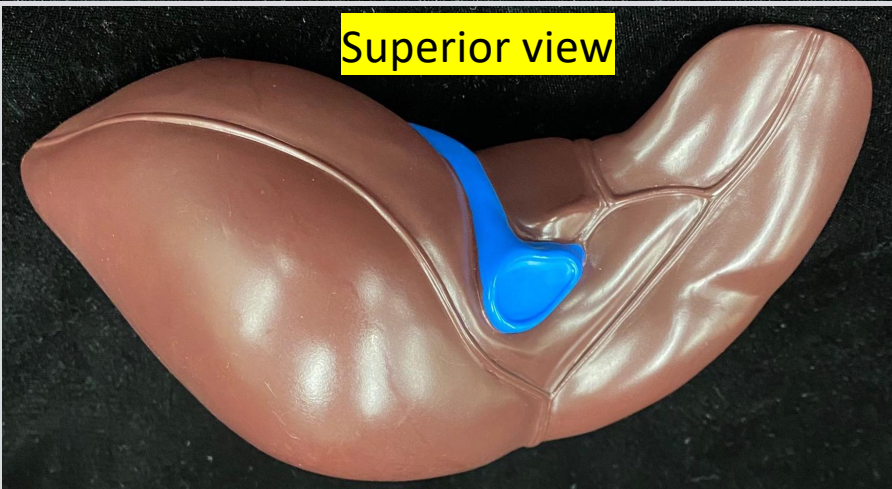


Liver Anatomy

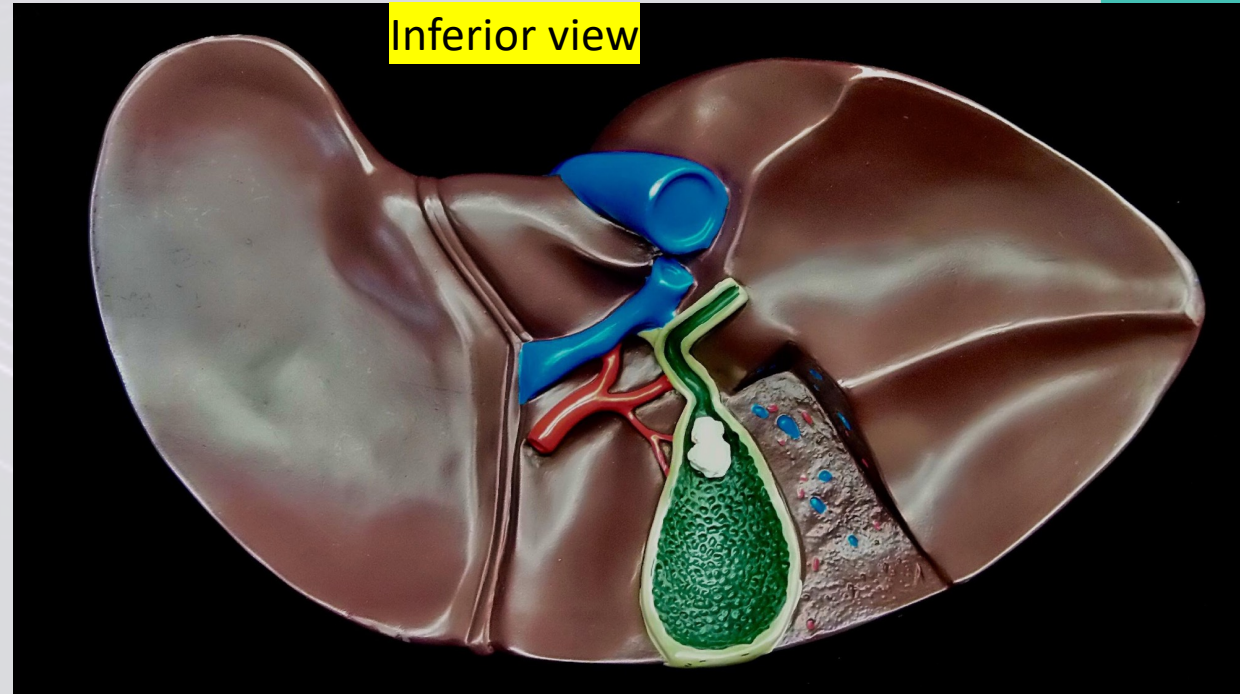
Anterior view



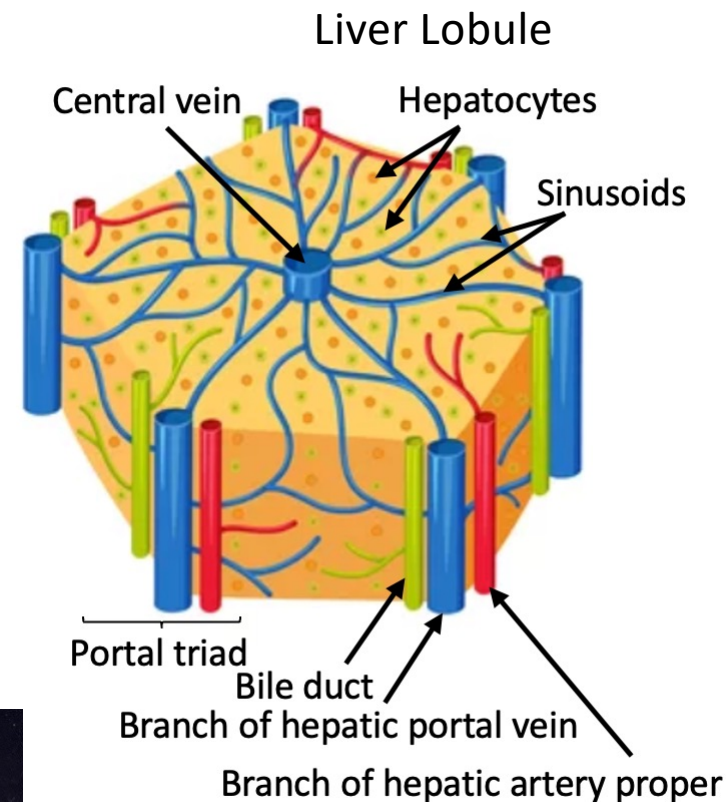
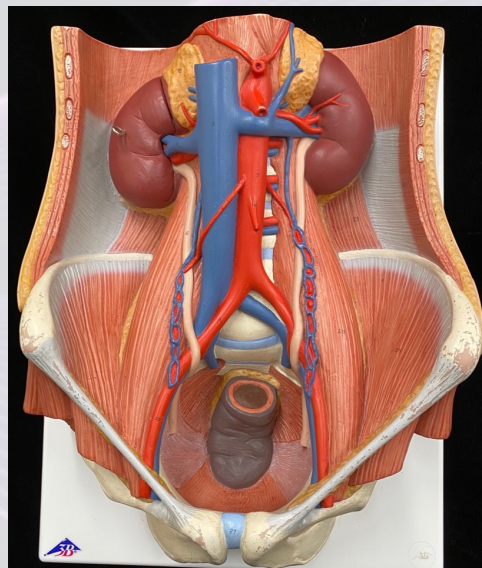
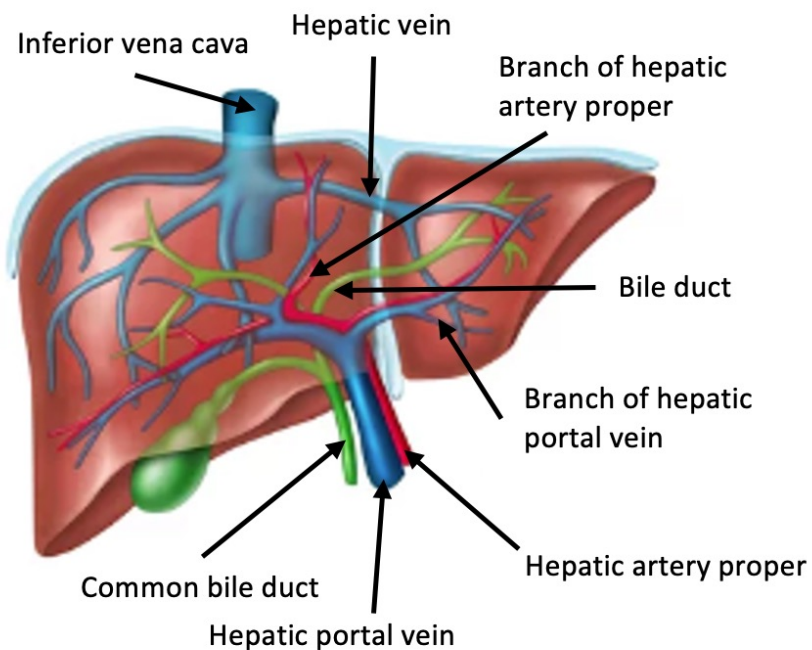
Superior view



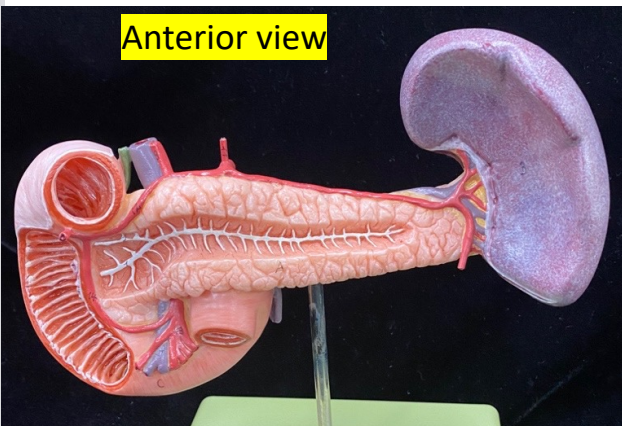
Inferior view



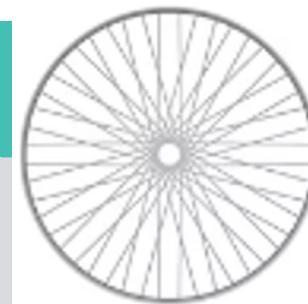
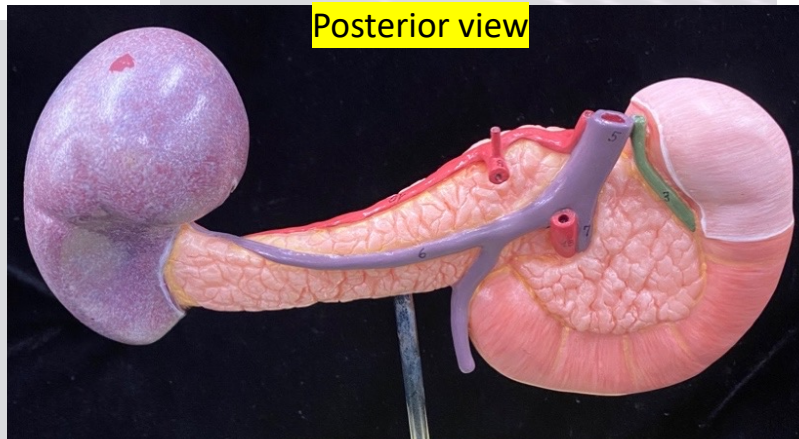
Liver Histological Organization



Anterior view



Posterior view



A. Metabolic Regulation

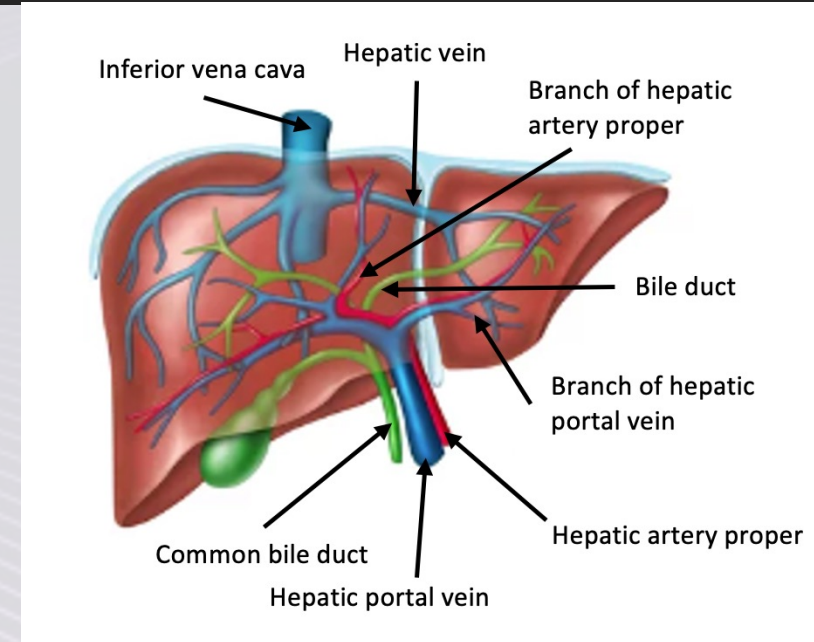
- Represents a central clearinghouse
- Regulates levels of:
 - ❖ Carbohydrates
 - ❖ Lipids
 - ❖ Amino acids
- Hepatic portal system → liver
- Hepatocytes
 - ❖ Monitor circulating levels of metabolites
 - ❖ Adjust if necessary
 - ❖ Removal of toxins
 - Inactivated
 - Stored
 - Excreted
 - ❖ Absorption and storage of fat-soluble vitamins

B. Hematological Regulation

- Largest blood reservoir in body
 - ❖ Receives 25% of CO
- Kupffer cells
 - ❖ RBCs
 - Old and damaged cells get removed
 - ❖ Removal of:
 - Cellular debris
 - Pathogens
- Hepatocytes
 - ❖ Synthesize plasma proteins
 - Blood osmotic concentration
 - Nutrient transport
 - Clotting and complement systems

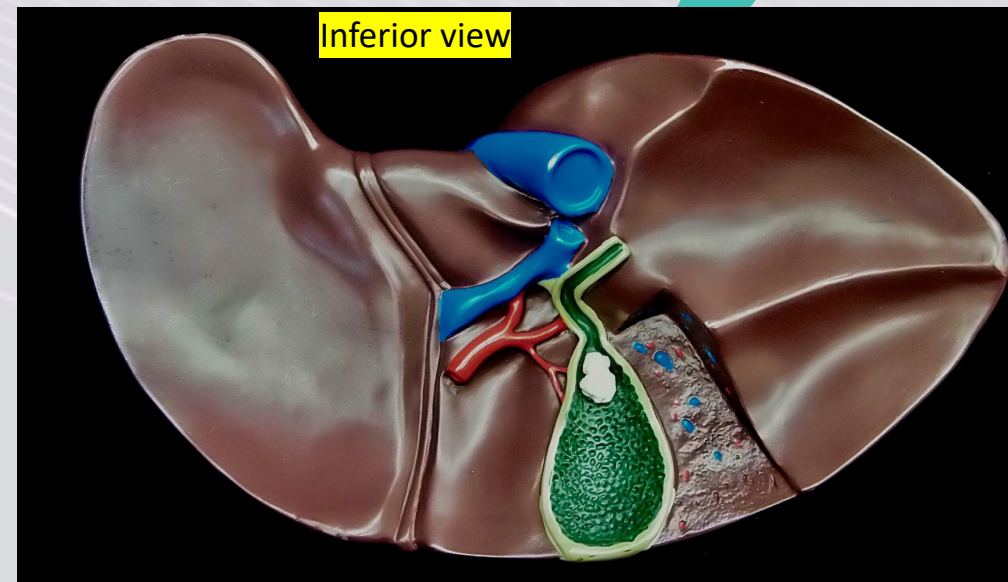
C. Bile Synthesis and Secretion

- Synthesized
 - ❖ Hepatocytes
 - Stored
 - ❖ Gallbladder
 - Excreted
 - ❖ Duodenum
 - Composition:
 - ❖ Water
 - ❖ Ions
 - ❖ Bilirubin
 - ❖ Bile salts + lipids in chyme = break down into fatty acids → absorption
- } Dilution and buffering of acids in chyme



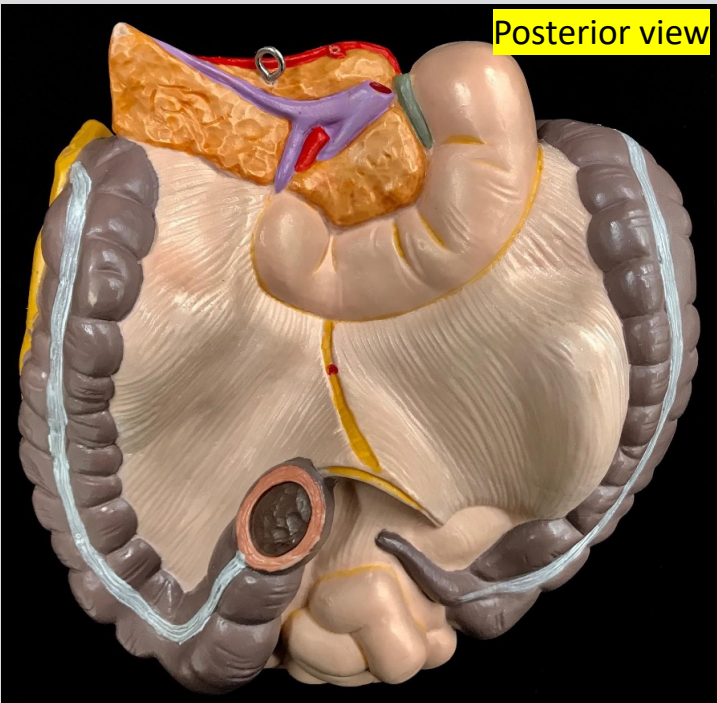
Gallbladder

- Functions
 - ❖ Bile storage (cystic duct)
 - ❖ Bile modification
 - Water is absorbed
 - Concentration of bile salts and other components
- Bile ejection
 - ❖ Cholecystokinin
 - Presence of:
 - Lipids
 - Proteins
 - ↓
 - Relaxation of sphincter of Oddi
 - Gallbladder contraction

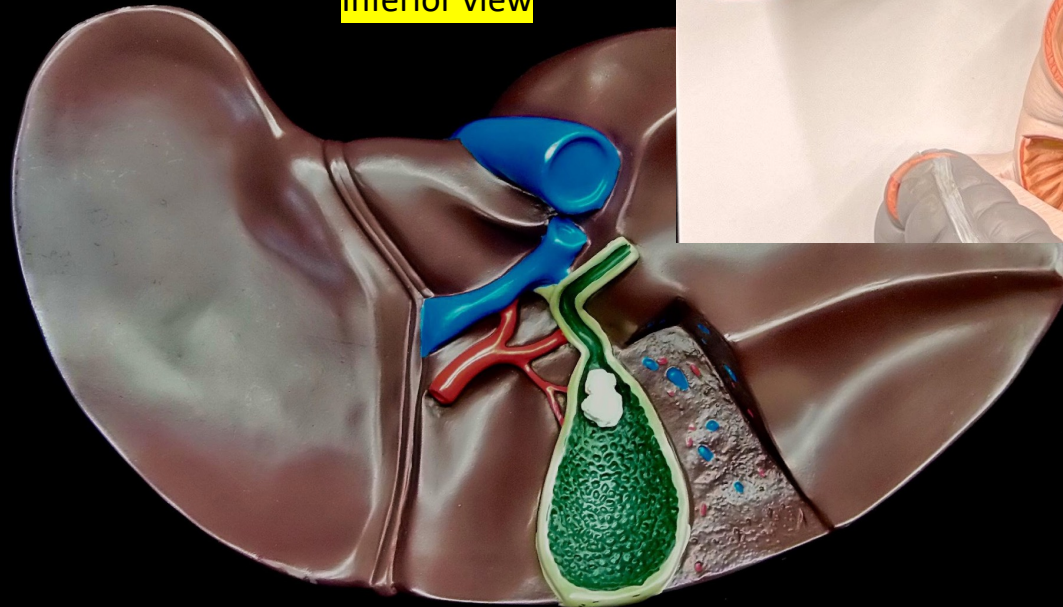


Lab Models

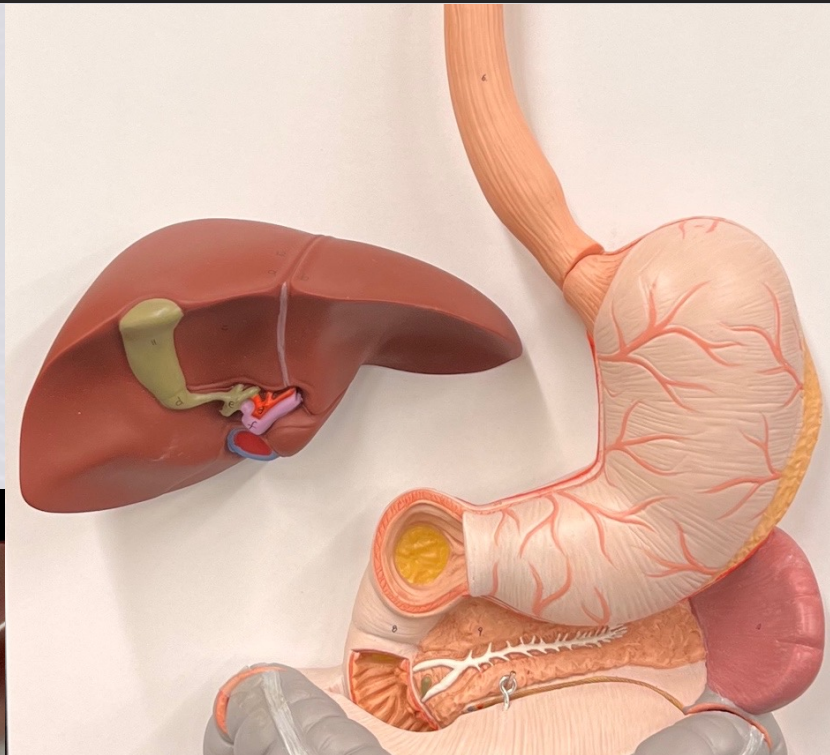
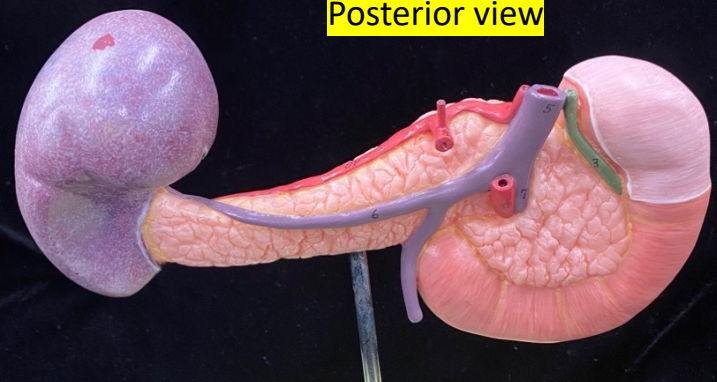
Posterior view



Inferior view



Posterior view



Pancreas

- Lies posterior to the stomach
- Pancreatic acini
 - ❖ Secrete pancreatic juice
 - Water + ions + pancreatic digestive enzymes
- Pancreatic enzymes
 - ❖ Lipases – digest lipids
 - ❖ Carbohydrase – digest sugars and starches
 - ❖ Nucleases – attach nucleic acids
 - ❖ Proteolytic enzymes – break proteins apart
 - Proteinases – large protein complexes
 - Peptidases - small peptide chains → amino acids
- Regulation of Pancreatic Secretion
 - ❖ Hormonal instructions from duodenum
 - Secretin – acidic chyme
 - Triggers → buffers
 - CCK – chyme in stomach and duodenum
 - Triggers → pancreatic juice

