UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	HDB30704
COURSE TITLE	:	CLINICAL LABORATORY HISTOLOGY
PROGRAMME NAME	:	BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)
DATE	:	03 FEBRUARY 2026
TIME	:	2:00PM - 5:00PM
DURATION	:	3 HOURS

Universiti Kuala Lumpur
ACADEMIC DEPT
MESTECH

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of ONE sections.
4. Section A consist of five questions. Answer FOUR (4) questions only.
5. Please write your answer on the answer booklet provided.
6. Please answer all questions in English only.
7. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

SECTION A (Total: 100 marks)

Answer FOUR (4) questions.

Please use the answer booklet provided.

Question 1

A research laboratory is studying the effects of aging on both the central nervous system (CNS) and the skeletal system. They are comparing tissue samples from an "Alzheimer's model" mouse and an "osteoporosis model" mouse.

(a) In the Alzheimer's model, the researchers want to evaluate neuronal integrity, neurofibrillary tangles, and neuritic plaques.

i. Propose the most appropriate staining technique to evaluate the size and arrangement of neuron cell bodies. Identify the specific intracellular structure within the neuron cell body that is demonstrated by this stain.

(3 marks)

ii. Propose the most appropriate staining technique to evaluate neurofibrillary tangles and neuritic plaques. Describe the specific microscopic appearance of the plaques and tangles using this stain.

(6 marks)

(b) In the osteoporosis model, the goal is to visualize the mineralized bone matrix versus the osteoid to assess bone density loss.

i. Propose the most appropriate staining technique for this purpose. Describe the specific microscopic appearance of the mineralized bone matrix and the osteoid using this stain.

(4 marks)

ii. If the objective is solely to visualize the mineralized bone matrix, suggest two staining techniques and describe the specific microscopic appearance of the mineralized bone matrix using each technique.

(4 marks)

(c) Both Alzheimer's disease and osteoporosis involve dysfunction of cells responsible for tissue maintenance and homeostasis, such as glial cells in the nervous system and bone-remodelling cells.

i. Name the two types of glial cells in the central nervous system (CNS) and compare their primary functions.

(4 marks)

ii. Name the two major bone-remodelling cells in the skeletal system and compare their key structural features.

(4 marks)

Question 2

The epithelial linings of the bladder (urinary system), trachea (respiratory system), and blood vessels (circulatory system) have unique adaptations that allow them to withstand stress, facilitate secretion, and tolerate pressure.

(a) Identify the specific type of epithelium lining of the:
i. Urinary bladder
ii. Trachea
iii. Lumen of a muscular artery (tunica intima)

(3 marks)

(b) Describe the unique morphological feature of the superficial cells (umbrella cells) in the bladder.

(3 marks)

(c) Explain the function of cilia in the respiratory mucosa.

(3 marks)

(d) Mucus secretion is a key defense mechanism in the respiratory tract.

i. Differentiate between goblet cells in the respiratory tract and club cells in the bronchioles with respect to their secretory products.

(3 marks)

ii. Alcian blue (pH 2.5) is commonly used in respiratory histology. Describe the specific component it detects, explain its clinical use in diagnosing conditions such as chronic bronchitis, and state the expected staining color.

(4 marks)

(e) In the urinary system, PAS stain is used to visualize glycogen. Which part of the urothelium might show glycogen deposits, and how do they appear?

(2 marks)

(f) Amyloidosis can lead to the deposition of abnormal proteins in the kidney, heart, and lungs.

i. Name the "gold standard" stain used to diagnose amyloidosis in these tissues.

(2 marks)

ii. Describe the characteristic appearance of amyloid deposits under a polarized light microscope.

(2 marks)

iii. In a renal biopsy, identify three (3) typical locations of these deposits.

(3 marks)

Question 3

The pancreas is a unique organ that functions as both an accessory digestive organ and an endocrine gland.

(a) Compare and contrast the histological structure of the exocrine and endocrine portions of the pancreas stained with H&E.

(7 marks)

(b) List three (3) cell types found in the pancreatic Islets of Langerhans.

(3 marks)

(c) While H&E provides general morphology, specialized stains are required to differentiate specific cell types within the Islets of Langerhans.

i. Suggest a stain used to differentiate the cell types in the pancreatic Islets of Langerhans.

(2 marks)

ii. Describe the specific colours exhibited by the different cell types in the pancreatic Islets of Langerhans when using the stain identified in c (i).

(4 marks)

iii. Name the hormones secreted by the cells identified in c(ii).

(2 marks)

(d) Identify the salivary gland that exhibits histological similarities to the exocrine pancreas.

(2 marks)

(e) Describe the histological similarities between the salivary gland and the exocrine pancreas.

(3 marks)

(f) Identify one key histological feature found in the salivary gland stroma that is notably absent or rare in the normal pancreas.

(2 marks)

Question 4

A skin biopsy is taken from one of the depigmented patches and submitted for histopathological examination. On review of the H&E section, the pathologist notes suspected abnormalities in the basement membrane zone and a noticeable absence of melanocytes in the affected areas.

(a) Abnormalities in the basement membrane or absence of melanocytes in the skin can be detected using special staining techniques that highlight specific tissue structures and cell components.

i. Suggest appropriate special stains (excluding immunohistochemistry) to demonstrate the basement membrane and the presence of melanocytes.

(4 marks)

ii. Explain the expected staining pattern or colour by the staining techniques in a) (i).

(4 marks)

iii. Suggest any other tissue components that can be demonstrated by the staining techniques in a) (i).

(2 marks)

(b) Discuss the seven major types of epithelial cells. In your answer, describe the structural characteristics of each type, including cell shape, layering, and any special features, and indicate their typical locations in the human body.

(14 marks)

(c) Classify the epithelium of the skin.

(1 marks)

Question 5

A laboratory is processing tissue from the male reproductive tract (epididymis) and performing immunohistochemical (IHC) staining for specific markers.

(a) Describe the epithelial lining and the specific surface modifications found in the epididymis and the vas deferens. How does the muscular layer of the vas deferens differ from the epididymis to support its function?

(8 marks)

(b) The seminiferous tubule is the site of sperm production, where cells are arranged in a specific stratified order.

i. Describe the progression (movement) of the germinal cell lineage within the seminiferous tubule.

(2 marks)

ii. Differentiate between spermatogenesis and spermiogenesis.

(2 marks)

iii. State three (3) distinct stages of developing germ cells found in this progression.

(3 marks)

iv. Name the tall columnar "nurse cell" found within this epithelium and state one (1) of its key functions.

(2 marks)

(c) The detection of specific antigens often requires a permeabilization step involving detergents during the IHC staining protocol.

i. Explain why permeabilization is strictly required for intracellular targets but is usually unnecessary for transmembrane proteins.

(4 marks)

ii. Differentiate between "harsh" detergents and "milder" detergents and give one (1) example each.

(4 marks)

END OF EXAMINATION PAPER