UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	HDB30703
COURSE TITLE	:	CLINICAL LABORATORY HISTOLOGY
PROGRAMME NAME	:	BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)
DATE	:	03 FEBRUARY 2026
TIME	:	2:00PM - 5:00PM
DURATION	:	3 HOURS

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*

THERE ARE 9 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 100 marks)

Answer FOUR (4) questions.

Please use the answer booklet provided.

Question 1

A fertility clinic sends a testicular biopsy sample to the laboratory for investigation of infertility. The clinic uses the standard fixative agent for all types of specimens.

(a) The resulting hematoxylin and eosin (H&E) stained slides show "wide spaces between seminiferous tubules and germinal epithelium cells," making the diagnosis difficult.

i. Identify the fixative agent likely used by the clinic that caused these artefacts.

(2 marks)

ii. State the recommended fixative agent of choice for testicular biopsies.

(2 marks)

iii. Identify the specific component in the recommended fixative agent of choice that imparts colour to the testicular tissue.

(2 marks)

iv. State the colour of the identified fixative's component.

(1 marks)

v. Compare the mechanism of action between coagulating fixatives and cross-linking fixatives.

(4 marks)

vi. Classify the fixative agent likely used by the clinic as either coagulating or cross-linking.

(1 marks)

(b) During tissue processing of the testicular biopsy, there is a risk of tissue loss.

i. Explain why there is a risk of tissue loss during tissue processing.

(2 marks)

ii. State the specific tool or material that should be used to prevent the testicular biopsy from being lost during processing.

(2 marks)

iii. Suggest another type of specimen that may require the same tool or material.

(1 marks)

iv. Describe the proper logging procedure for a testicular biopsy specimen.

(4 marks)

v. In the laboratory, who is responsible for performing the logging process?

(1 marks)

vi. List three (3) possible reasons for rejecting a testicular biopsy during specimen logging.

(3 marks)

Question 2

A student is embedding a variety of tissues including a tubular fallopian tube, a skin ellipse, and a fragment of intestine. Later, during microtomy, the student struggles with obtaining a good ribbon.

(a) Describe the correct orientation for embedding the following tissues to ensure proper microscopic examination:
i. Tubular tissue (e.g., Fallopian tube)
ii. Skin (Epithelial surface)
iii. Intestine (Membranous/Tubular)

(6 marks)

(b) During microtomy, the tissue physically separates and comes out from the paraffin block.

i. Suggest two (2) possible causes for this separation.

(4 marks)

ii. Provide a solution for each of the suggested causes.

(4 marks)

(c) The student suspects the microtome angle is incorrect.

i. Define clearance angle.

(2 marks)

ii. What is the manufacturer's recommended range for the clearance angle?

(1 marks)

iii. Predict the consequence on the tissue ribbon if the clearance angle of the microtome knife is too shallow.

(4 marks)

iv. Predict the consequence on the tissue ribbon if the clearance angle of the microtome knife is too steep.

(4 marks)

Question 3

A liver biopsy from a patient with chronic hepatitis B is received. The pathologist requests a hematoxylin and eosin (H&E) stain to assess inflammation. Upon reviewing the H&E slide, the pathologist notes that the nuclei appear too pale, with bluish-black precipitates present, making it difficult to analyze the hepatocytes.

(a) Suggest two (2) possible technical causes for the pale-stained nuclei, and for each cause, propose an appropriate troubleshooting step to correct the issue.

(4 marks)

(b) Suggest the possible technical cause for the bluish-black precipitate, and propose the appropriate troubleshooting step to correct the issue.

(2 marks)

(c) Compare the role of differentiation and bluing steps in a regressive H&E staining protocol.

(4 marks)

(d) State the role of a mordant in a regressive H&E staining protocol.

(2 marks)

(e) The pathologist also requests a special stain to evaluate the stage of cirrhosis (fibrosis).

i. Suggest one (1) suitable stain to assess the degree of fibrosis (cirrhosis) in this liver biopsy, and state the expected colour of the fibrotic fibers.

(3 marks)

ii. Apart from investigating hepatic fibrosis (cirrhosis), suggest two (2) other diseases or pathological conditions in which these stains are commonly used.

(4 marks)

iii. Compare the nuclear staining dye used in the H&E staining protocol with that used in the suggested special stain for assessing the degree of fibrosis.

(4 marks)

iv. In H&E staining, eosin stains the cytoplasm pink. In the suggested special stain for assessing the degree of fibrosis, which dye is responsible for staining the cytoplasm, and what is its expected colour?

(2 marks)

Question 4

A muscle biopsy is received from a patient suspected of having McArdle's disease. The pathologist requests both enzyme histochemical and carbohydrate staining protocols to confirm the diagnosis.

(a) Explain the importance of including a 'substrate' in the reagent mixture used for the enzyme histochemical staining protocol.

(2 marks)

(b) A muscle biopsy specimen is submitted in formalin fixative. Explain whether enzyme histochemical staining can be performed on this sample, and provide a justification for your answer.

(4 marks)

(c) Some of the slides are stained with the phosphorylase enzyme histochemical stain. Explain the diagnostic principle for McArdle's disease using the phosphorylase stain.

(4 marks)

(d) Name the class of enzymes to which phosphorylase belongs.

(2 marks)

(e) The technician incubates the phosphorylase slide at 60°C to "speed up" the reaction. Predict the consequence of this action.

(5 marks)

(f) Identify the correct staining pair for detecting glycogen in muscle fibers.

(2 marks)

(g) Based on the correct staining pair for glycogen, describe the expected histological appearance of muscle fibers in McArdle disease.

(4 marks)

(h) Suggest the most recommended fixative agent for glycogen preservation to prevent its dissolution during processing.

(2 marks)

Question 5

A skin biopsy from a patient with a suspicious pigmented lesion is received. The preliminary H&E stain shows clusters of cells containing brown pigment. The pathologist suspects malignant melanoma but needs to confirm if the pigment is melanin or hemosiderin, and also wants to subtype the tumor using specific immunohistochemistry (IHC) markers.

(a) Recommend one special staining protocol to confirm the presence of melanin and one to confirm the presence of hemosiderin in tissue sections.

(4 marks)

(b) Explain the principles of both recommended special staining protocols.

(6 marks)

(c) The histopathologist orders an IHC stain for HMB-45 (a melanoma marker).

i. Describe the basic principle of the indirect IHC detection method used for this test.

(3 marks)

ii. Explain how signal amplification is achieved in the biotin-conjugated detection system.

(3 marks)

iii. Differentiate between monoclonal and polyclonal antibodies, highlighting their advantages.

(5 marks)

iv. The initial IHC run shows strong background staining across the entire tissue section. Identify two (2) potential causes for this strong background staining in IHC.

(4 marks)

END OF EXAMINATION PAPER