UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

MARCH 2025 SEMESTER

COURSE CODE	:	HDD20803
COURSE TITLE	:	HISTOTECHNOLOGY
PROGRAMME NAME	:	DIPLOMA OF MEDICAL LABORATORY TECHNOLOGY
DATE	:	26 JUNE 2025
TIME	:	9:00AM - 12:00PM
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 TWO sections.
4. Section A consist 25 MCQ or EMQ questions. Answer ALL questions.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. ☐ *Tick if applicable*
9. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

THERE ARE 13 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 25 marks)

Answer ALL questions.

Please use the objective answer sheet provided.

1. Which of the following professionals is commonly responsible for the preparation and staining of tissue samples in the histology lab?

   A. Histotechnician

   B. Histology laboratory manager

   C. Histology reception assistant

   D. Histopathologist

2. The main role of the embedding station is to _____.

   A. orient a tissue in a paraffin block

   B. slice a tissue into thin sections

   C. apply stains to a tissue section

   D. fix a tissue using formalin

3. Which of the following hazards is considered critical in a histology lab?

   A. Hot paraffin wax

   B. Broken glassware

   C. Acidic eosin solution

   D. Formalin and xylene vapours

4. Which of the following is a valid reason to reject a histology specimen?

   A. The container is labelled with a pencil.

   B. The tissue specimen appears pale.

   C. The container lacks fixative medium.

   D. The tissue specimen is too small.

5. Why is phosphate buffer added to 10% formalin to make 10% neutral buffered formalin (10% NBF)?

   A. To increase tissue softness.

   B. To prevent formalin pigment.

   C. To enhance alcohol evaporation.

   D. To help with stain absorption.

6. A histotechnician accidentally uses 10% unbuffered formalin instead of 10% neutral buffered formalin for routine tissue fixation. What technical problem is most likely to occur?

   A. Incomplete tissue penetration.

   B. Excessive shrinkage of connective tissue.

   C. Loss of nuclear detail due to dehydration.

   D. Formation of unwanted pigment artifacts.

7. How does the size of the tissue specimen affect processing time?

   A. Bigger tissue specimens need less time to process.

   B. Smaller tissue specimens need more time to process.

   C. Bigger tissue specimens need more time to process.

   D. Big and small tissue specimens have the same processing time.

8. Which of the following issues may arise if the xylene used during tissue processing becomes saturated with contaminants?

   A. Tissue shrinks excessively.

   B. Tissue becomes brittle.

   C. Tissue changes colour.

   D. Tissue appears soft or mushy.

9. Why is 1% eosin sometimes added to biopsy specimens before tissue processing?

   A. To reduce biopsy specimen shrinkage.

   B. To improve the fixative process.

   C. To improve the specimen visibility.

   D. To enhance paraffin penetration.

10. Which type of microtome is commonly used for routine paraffin sectioning in histopathology labs?

   A. Cryotome

   B. Sliding microtome

   C. Ultramicrotome

   D. Rotary microtome

11. What may happen if the clearance angle of the blade is too steep during sectioning?

   A. The tissue may compress.

   B. The section has a chatter artefact.

   C. The blade will not contact the tissue.

   D. The ribbon will not form.

12. How does hematoxylin staining is controlled in the progressive hematoxylin staining technique?

   A. By over-staining followed by differentiation.

   B. By adjusting the pH of the eosin.

   C. By staining until the desired intensity is achieved.

   D. By bleaching the tissue sections before staining.

13. Which of the following dye interactions involves dye aggregation rather than ionic bonding?

    A. Eosin binding

    B. Hematoxylin binding

    C. Congo red binding

    D. Toluidine blue binding

14. What colour do elastic fibers appear when stained with Verhoeff-Van Gieson?

    A. Yellow

    B. Green

    C. Black

    D. Red

15. Which staining outcome best indicates a properly performed Masson-Goldner's trichrome?

    A. Intense orange staining of all bone cells.

    B. Uniform brown colour of bone and marrow.

    C. Blue-coloured osteoblast and yellow cytoplasm.

    D. Green-stained bone matrix with black nuclei.

16. What is the main function of Nile blue sulphate stain in histological sections?

    A. To identify amyloid.

    B. To demonstrate phospholipids.

    C. To visualize chromaffin cells.

    D. To stain muscle striations.

17. Which of the following staining outcomes is characteristic of sulfomucins in Alcian blue-high iron diamine (AB-HID) staining?

    A. Brown-black

    B. Aqua marine blue

    C. Emerald green

    D. Bright red

18. Which of the following pigments is detected using Fouchet–Van Gieson stain in liver tissue?

    A. Hemoglobin

    B. Melanin

    C. Hemosiderin

    D. Bile pigments

19. Which of the following colours indicates a positive result in Fontana–Masson stain for melanin?

    A. Black

    B. Purple

    C. Pink

    D. Yellow

20. Which of the following metals is selectively stained using Rhodanine in histological tissue sections?

    A. Copper

    B. Calcium

    C. Lead

    D. Iron

21. Which of the following colours is typically observed in areas rich in phosphorylase activity?

A. Brown

B. Blue

C. Red

D. Black

22. Which muscle fiber type appears dark greyish brown in the ATPase stain?

A. Hybrid fibers

B. Type IIb

C. Type I

D. Type IIa

23. What is the role of succinate dehydrogenase (SDH) staining in muscle histology?

A. To highlight lipid vacuoles.

B. To assess glycogen storage.

C. To demonstrate connective tissue.

D. To evaluate mitochondrial activity.

24. Which of the following is the key advantage of monoclonal antibodies in immunohistochemistry (IHC)?

A. They show consistent performance across batches.

B. They are less specific but highly sensitive.

C. They require complex purification steps.

D. They bind multiple epitopes on different proteins.

25. Which of the following is the purpose of the positive control in immunohistochemistry (IHC)?

A. To detect nonspecific background signal.

B. To confirm that the antibody binds to unrelated tissues.

C. To validate that staining reagents are functioning.

D. To eliminate the need for protein blocking.

SECTION B (Total: 75 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

A histotechnician was assigned to section and stain a paraffin-embedded skin tissue block. During microtome sectioning, the tissue sections were repeatedly stuck to the block face on the return stroke and frequently split down the middle, preventing proper ribbon formation. After performing minor adjustments, a few usable sections were obtained and stained using the routine hematoxylin and eosin (H&E) protocol. However, under microscopic examination, the nuclei appeared pale, while eosin staining was adequate. The histotechnician suspected that technical errors occurred during both the sectioning and staining processes.
Based on this scenario, answer the following questions:

(a) Predict two possible causes of the section sticking to the block face on the return stroke and suggest a solution for each cause.

(4 marks)

(b) Predict two possible causes of the section splitting in the middle and suggest a solution for each cause.

(4 marks)

(c) Predict two possible causes of the pale nuclei of the H&E-stained skin section and suggest a solution for each cause.

(4 marks)

(d) Compare the staining properties of hematoxylin and eosin in terms of target structures and chemical affinities.

(4 marks)

(e) List 4 types of microtome blades and knives.

(4 marks)

(f) Explain the preferred orientation of a paraffin-embedded skin tissue block to the microtome blade.

Refer Below - Figure1 : The image illustrates the orientation of a skin tissue block to the microtome blade. .

(1 marks)

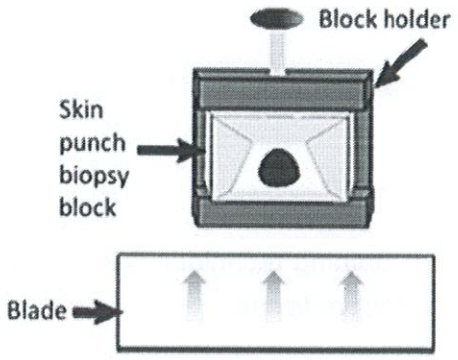

Figure 1: The image illustrates the orientation of a skin tissue block to the microtome blade.

(g) Explain the purpose of the following hematoxylin and eosin (H&E) staining steps:
Deparaffinization in xylene
Differentiation in 1% acid alcohol

(2 marks)

(h) State two acceptable criteria for mounting media.

(2 marks)

Question 2

Van Gieson's trichrome is a specialized connective tissue staining technique that highlights structural components, allowing detailed evaluation of pathological changes.
Based on the statement, answer the following questions.

(a) Name the specialized connective tissue visualized using Van Gieson's trichrome staining technique.

(1 marks)

(b) State the appropriate fixative agent used for Van Gieson's trichrome staining.

(2 marks)

(c) Suggest an alternative staining technique that can be used to visualize the same type of specialized connective tissue.

(2 marks)

(d) Compare the colour interpretation of the specialized connective tissue between Van Gieson's trichrome and the alternative staining techniques.

(6 marks)

(e) Specify the reagents employed in each staining technique that contribute to the resultant colours.

(6 marks)

(f) Compare the colour interpretation of the cytoplasm between Van Gieson's trichrome and the alternative staining techniques.

(4 marks)

(g) Explain two diagnostic applications of Van Gieson's trichrome staining technique.

(4 marks)

Question 3

Periodic acid–Schiff (PAS) and PAS with diastase (PAS-D) are specialized staining techniques used to identify carbohydrates in tissue, allowing for more precise tissue evaluation.
Based on the statement, answer the following questions.

(a) Describe the staining principles of Periodic acid solution, Schiff reagent, and diastase.

(6 marks)

(b) In the PAS-D staining technique, should diastase digestion be performed before or after applying the PAS stain?

(1 marks)

(c) List three PAS-positive substances (for example, polysaccharides)

(6 marks)

(d) Differentiate the diagnostic applications of Periodic acid–Schiff (PAS) and PAS with diastase (PAS-D) staining techniques.

(12 marks)

Question 4

Immunohistochemistry (IHC) is a specialized technique that uses antibodies to detect specific antigens in tissue sections, enabling precise localization of proteins for diagnostic and research purposes.
Based on the statement, answer the following questions.

(a) Compare the advantages of using formalin-fixed paraffin-embedded (FFPE) and frozen tissue sections for immunohistochemistry (IHC).

(8 marks)

(b) Explain the function of the antigen retrieval step in immunohistochemistry (IHC).

(2 marks)

(c) Explain the mechanisms of heat-induced epitope retrieval (HIER) and proteolytic-induced epitope retrieval (PIER).

(4 marks)

(d) State the function of the permeabilization step in IHC staining.

(1 marks)

(e) There are two types of blocking steps. Explain the functions and commonly used reagents in protein blocking and endogenous enzyme blocking.

(8 marks)

(f) Explain the characteristics of the biotinylated secondary antibody.

(2 marks)

END OF EXAMINATION PAPER