UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	HDD30103
COURSE TITLE	:	TRANSFUSION SCIENCE AND BLOOD BANKING
PROGRAMME NAME	:	DIPLOMA OF MEDICAL LABORATORY TECHNOLOGY
DATE	:	28 JANUARY 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 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 statements is the best approach to provide employees with adequate protection and ensure a safe laboratory environment?

   A. Provide health insurance

   B. Offer safety education

   C. Allow regular break periods

   D. Equip them with fluid-resistant lab coats

2. The primary factor influencing electrostatic repulsion between red blood cells is the _____.

   A. pH of the test environment

   B. dielectric constant

   C. immunoglobulin class

   D. zeta potential

3. During routine crossmatching, the technologist mistakenly increased the centrifugation speed and time. The crossmatch's result showed strong agglutination, but the antibody screen was negative. Which of the following options best explains this discrepancy?

   A. Antibody denaturation due to prolonged centrifugation

   B. Enhanced IgM activity due to increased temperature

   C. False-positive reaction from forced cell-to-cell contact

   D. Reduced zeta potential due to high-speed spinning

4. Which of the following reagents is appropriate for detecting unexpected red cell antibodies in a patient's serum sample?

   A. A_1 and B cells

   B. Panel cells

   C. Screening cells

   D. IgG-sensitized cells

5. Which of the following reagents is appropriate for identifying unexpected red cell antibodies in a patient's serum sample?

   A. Screening cells.

   B. A_1 and B cells.

   C. Panel cells.

   D. IgG-sensitized cells.

6. After the addition of anti-D reagent to a patient's red cell suspension, an agglutination was observed. The result with the anti-A reagent was negative. Which of the following is the interpretation of this patient's D typing?

   A. The patient is D-negative

   B. The patient is D-positive

   C. Invalid result

   D. Cannot interpret the test

7. Which of the following methods is most suitable for large-scale testing in blood centres?

   A. Tube method

   B. Gel card technology

   C. Microplate technique

   D. Tile method

8. Which of the following best describes the principle of the solid-phase red cell adherence method?

   A. Enzyme-linked detection of antibodies

   B. Centrifuge-assisted detection of antibodies

   C. Fluorescence-based antigen detection

   D. Immobilized antigen/antibody captures counterpart

9. Given the following ABO typing results of Mr. Ali, which of the following ABO phenotypes would be compatible if Mr. Ali required a transfusion of packed red cells? *Refer Below - Figure1 : ABO Typing .*

ABO Testing Results			
Patient Red Cells with Reagent Antisera		Patient Serum with Reagent Red Cells	
Anti-A	Anti-B	A1	B
0	0	4+	4+

Figure 1: ABO Typing

   A. Group AB or O

   B. Only group O

   C. Group O or B

   D. Group A, B, AB or O

10. Given the following ABO typing results, what conclusion can be drawn from these results?
Refer Below - Figure2 : ABO Typing .

ABO Testing Results			
Patient Red Cells with Reagent Antisera		Patient Serum with Reagent Red Cells	
Anti-A	Anti-B	A1	B
4+	4+	1+	0

Figure 2: ABO Typing

A. Expected results for a group AB individual

B. Expected results for a group O individual

C. Discrepant results: patient has B antigen on red cells with anti-B in serum

D. Discrepant results: patient has A antigen on red cells with anti-A in serum

11. Given the following ABO typing results of Mr. Ahmad, which of the following ABO phenotypes would be compatible if Mr. Ahmad required a transfusion of fresh frozen plasma?
Refer Below - Figure3 : ABO Typing .

ABO Testing Results			
Patient Red Cells with Reagent Antisera		Patient Serum with Reagent Red Cells	
Anti-A	Anti-B	A1	B
0	0	4+	4+

Figure 3: ABO Typing

A. Only group O

B. Group A, B, AB, or O

C. Group O or B

D. Group AB or O

12. Anti-D was detected in the serum of a D-positive person. Which of the following best describes this condition?

    A. Regulator gene failure

    B. A compound antibody was formed

    C. The antibody is anti-G

    D. Missing antigen epitope

13. Which of the following genes are responsible for the production of Rh antigens?

    A. RHAG, RH1, and RH2

    B. RHAG, RHD, and RHCE

    C. RHAG, RHCc, and RHEe

    D. RHAG, DCE, and dce

14. Which of the following statements is true regarding weak D phenotype?

    A. It is a qualitative variant of the D antigens

    B. A donor with weak D is being labelled as D-negative individual

    C. It is identified by an indirect antiglobulin test

    D. High risk of developing anti-D if given transfusion of a D+ blood

15. A patient has the following Rh phenotype: D+, C+, c+, E+, e+. Which of the following is the most likely Rh genotype?

    A. R2r

    B. R1R2

    C. R1R1

    D. R2r"

16. A 34-year-old lady is Rhesus negative with the rr genotype. She is pregnant with her second baby. Her husband has the R1R1 genotype. Her indirect antiglobulin test (IAT) is positive. Which of the following is the most likely cause for the positive IAT?

    A. Presence of anti-E

    B. Presence of anti-c

    C. Presence of anti-D

    D. Presence of anti-Cw

17. The McLeod phenotype is associated with _____.

    A. Rh_{null} phenotype

    B. U-negative phenotype

    C. K_0 phenotype

    D. Absence of Kx antigens

18. Reagent antibody screening cells may not be able to detect antibodies directed against low-incidence antigens. Which of the following antibodies is most likely to be undetected?

    A. S

    B. Vel

    C. K

    D. Kp^a

19. RBCs that have been frozen are stored at which minimum temperature and maximum storage time?

    A. -65°C for 5 years

    B. -80°C for 10 years

    C. -85°C for 10 years

    D. -65°C for 10 years

20. What is the minimum platelet count required for an apheresis platelet unit to be considered acceptable for transfusion?

A. 5.5×10^{11}

B. 3.0×10^{11}

C. 5.5×10^{10}

D. 3.3×10^{9}

21. In antibody identification, the term "dosage" is used to describe certain antibodies. Which of the following statements most accurately explains the significance of an antibody demonstrating dosage?

A. It reacts only with heterozygous cells

B. It does not react with red cells lacking the corresponding antigen

C. It reacts more strongly with homozygous cells than with heterozygous cells

D. It reacts equally with both homozygous and heterozygous cells

22. Detection of serologic incompatibility between donor RBCs and recipient serum is performed in which of the following tests?

A. Antibody screen

B. Direct antiglobulin test

C. Antibody identification

D. Crossmatch

23. The type of a donor unit of RBCs was tested with the following results. The donor unit was labelled group A, D-negative. Which of the following is the most appropriate next step?
Refer Below - Figure4 : ABO Typing .

Red Blood Cells Tested with:		
Anti-A	Anti-B	Anti-D
4+	0	3+

Figure 4: ABO Typing

A. Transfuse as a group A, D-positive

B. Discard the unit

C. Transfuse as a group A, D-negative

D. Notify the collection facility

24. Dyspnoea, severe headache, and peripheral oedema occurring soon after transfusion are indicative of which type of transfusion reaction?

A. Haemolytic

B. Transfusion-related acute lung injury (TRALI)

C. Anaphylactic

D. Transfusion-associated circulatory overload (TACO)

25. Post-transfusion purpura following transfusion of a platelet or RBC unit is usually caused by _____.

A. febrile reactions secondary to cytokines in the unit

B. human leukocyte antigen antibodies in the donor unit

C. anti-HPA-1a made by the recipient

D. human leukocyte antigen antibodies made by the recipient

SECTION B (Total: 75 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

Pusat Darah Negara received a transfusion request for 6 units of R1R1 RBCs for a transfusion recipient from Hospital Selayang. Based on this request, answer the following questions.

(a) Determine the Rh blood group system antigens that are required to be negative.

(4 marks)

(b) Predict the Rh antigens that these units possess.

(6 marks)

(c) Identify the requested R1R1 donor units in Fisher-Race terminology.

(2 marks)

(d) Can this blood product request be supplied without difficulty? Justify your answer.

(4 marks)

(e) Identify the antibodies that an R1R1 donor may form if exposed to incompatible Rh antigens during transfusion. Justify your answer.

(6 marks)

(f) For the antibodies identified in (e), describe their immunoglobulin class, temperature reactivity, and clinical significance.

(3 marks)

Question 2

A 27-year-old woman is a first-time donor at your blood center. She is a healthy donor with an unremarkable medical history and is not taking any medications. Her ABO phenotyping results are shown below.

Refer Below - Figure5 : ABO & RhD Typing .

ABO & Rh D Testing Results							
Forward Typing			Rh D typing		Reverse Typing		
Anti-A	Anti-B	Anti-AB	Anti-D	Control D	A1 cell	B cell	O cell
							

Figure 5: ABO & RhD Typing

(a) Grade the reactions observed in each test of the forward and Rh D typing.

(5 marks)

(b) Predict the serum reactions (using the grading system) for this patient when tested with A_1 cells, B cells, and O cells.

(3 marks)

(c) Identify the blood group and Rhesus typing of this patient.

(2 marks)

(d) Illustrate the test principle of forward typing used in the patient's ABO phenotyping.

(3 marks)

(e) Justify why the determination of the ABO blood group requires both forward and reverse typing.

(6 marks)

(f) Several types of ABO discrepancies may occur during ABO phenotyping. Determine three possible problems associated with forward red cell typing and provide one example for each.

(6 marks)

Question 3

A 10-year-old transfusion-dependent patient with beta thalassemia major and blood group O Rh-positive demonstrates crossmatch incompatibility with two units of the same blood group. His antigram results of antibody identification using a 10-cell panel are provided below.
Refer Below - Figure6 : Antigram for antibody identification .

Cell	Rh	C	D	E	c	e	C^w	M	N	S	s	P1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	Other	IS	37	IAT
1	$R_1{}^wR_1$	+	+	0	0	+	+	+	+	0	+	+	0	+	+	0	+	0	0	+	+	0		0	0	0
2	R_1R_1	+	+	0	0	+	0	+	0	+	0	+	0	0	+	0	0	+	+	0	0	+		0	0	0
3	R_2R_2	0	+	+	+	0	0	0	+	0	+	+	0	0	+	+	0	+	+	0	0	+		0	3	4
4	r'r	+	0	0	+	+	0	0	+	0	+	+	0	0	+	0	+	0	0	+	0	+	Kna-	0	0	0
5	r"r	0	0	+	+	+	0	+	0	+	0	+	0	0	+	0	+	0	0	+	+	0		0	4	4
6	rr	0	0	0	+	+	0	+	0	+	0	+	0	+	0	0	0	+	+	0	0	+		0	0	0
7	rr	0	0	0	+	+	0	0	+	0	+	+	0	+	+	0	0	+	+	w	0	+		0	0	0
8	rr	0	0	0	+	+	0	+	+	0	+	0	0	0	+	+	+	0	+	0	+	0		0	0	0
9	rr	0	0	0	+	+	0	+	0	0	+	0	+	0	+	0	0	+	0	+	0	+		0	0	0
10	rr	0	0	0	+	+	0	0	+	+	0	+	0	0	+	0	0	+	0	+	+	0		0	0	0
Auto																							Auto	0	0	0
Reagent											DAT Profile			Anti-IgG		IgA		IgM		C3c		C3d		Ctrl		
Lot No											Result															

Figure 6: Antigram for antibody identification

(a) Using the antigram given, show the "ruling out" or "crossing out" of antigens.

(20 marks)

(b) Identify the antibody, its immunoglobulin class, and the expected reactivity of the antibody.

(3 marks)

(c) Predict the possible blood group (with genotype) to be given to this patient.

(2 marks)

Question 4

Insyirah, a female neonate born to a 23-year-old woman, developed jaundice 4 hours after birth. The neonate's red cells were A, D positive, while the mother's red cells were O, D negative. A fetomaternal hemorrhage screen was negative. The direct antiglobulin test (DAT) was positive on the cord red cells, and anti-B was detected in the neonatal red cell eluate. Her erythrocyte glucose-6-phosphate dehydrogenase (G6PD) activity was normal, and the sickle cell test was negative. The jaundice was considered mild and treated accordingly. She was discharged on day 8.

(a) Identify the possible condition experienced by Insyirah.

(2 marks)

(b) Describe one possible explanation for the condition experienced by Insyirah and the red cell destruction that led to jaundice.

(5 marks)

(c) Suggest one treatment that was used to treat Insyirah.

(2 marks)

(d) Identify three laboratory tests that can be conducted both for the mother and the fetus to predict, prevent, or monitor the occurrence of the disease before delivery.

(6 marks)

(e) Describe five laboratory tests that can be conducted to monitor and treat the disease after delivery in both mother and infant.

(10 marks)

END OF EXAMINATION PAPER

Cell	Rh	C	D	E	c	e	C^w	M	N	S	s	P1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	Other	IS	37	IAT
1	$R_1^wR_1$	+	+	0	0	+	+	+	+	0	+	+	0	+	+	0	+	0	0	+	+	0		0	0	0
2	R_1R_1	+	+	0	0	+	0	+	0	+	0	+	0	0	+	0	0	+	+	0	0	+		0	0	0
3	R_2R_2	0	+	+	+	0	0	0	+	0	+	+	0	0	+	+	0	+	+	0	0	+		0	3	4
4	r'r	+	0	0	+	+	0	0	+	0	+	+	0	0	+	0	+	0	0	+	0	+	Kna-	0	0	0
5	r"r	0	0	+	+	+	0	+	0	+	0	+	0	0	+	0	+	0	0	+	+	0		0	4	4
6	rr	0	0	0	+	+	0	+	0	+	0	+	0	+	0	0	0	+	+	0	0	+		0	0	0
7	rr	0	0	0	+	+	0	0	+	0	+	+	0	+	+	0	0	+	+	w	0	+		0	0	0
8	rr	0	0	0	+	+	0	+	+	0	+	0	0	0	+	+	+	0	+	0	+	0		0	0	0
9	rr	0	0	0	+	+	0	+	0	0	+	0	+	0	+	0	0	+	0	+	0	+		0	0	0
10	rr	0	0	0	+	+	0	0	+	+	0	+	0	0	+	0	0	+	0	+	+	0		0	0	0
Auto																							auto	0	0	0

Reagent					DAT Profile	Anti-IgG	IgA	IgM	C3c	C3d	Ctrl
Lot No					Result						