UNIVERSITI KUALA LUMPUR
INSTITUTE OF MEDICAL SCIENCE TECHNOLOGY

FINAL EXAMINATION

MARCH 2025 SEMESTER

COURSE CODE	:	HDB30904
COURSE TITLE	:	TRANSFUSION SCIENCE AND BLOOD BANKING
PROGRAMME NAME	:	BACHELOR OF BIOMEDICAL SCIENCE (HONOURS)
DATE	:	21 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. Answer ALL questions for Section A.
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 18 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

1. Which of the following is the primary focus of the International Society of Blood Transfusion (ISBT) code of ethics?

   A. Reducing costs of blood transfusion services

   B. Promoting research in blood transfusion.

   C. Ensuring patient safety and ethical practices.

   D. Standardizing blood testing procedures.

2. What does the principle of autonomy emphasize in the ISBT code of ethics?

   A. Ensuring blood compatibility before transfusion to protect patients.

   B. Respecting individuals' right to choose whether to donate or receive a transfusion.

   C. Fair and equitable access to blood transfusion services for all patients.

   D. Treating all donors and patients with respect and valuing their worth.

3. How should donors be treated according to the principle of non-maleficence in the ISBT code of ethics?

   A. Donors have the right to make informed decisions about donating blood.

   B. Donors should be provided with safe donation practices to avoid harm.

   C. Donors should be compensated based on donation frequency.

   D. Donors should be treated with respect throughout the donation process.

4. Which of the following scenarios would violate the principle of non-remunerated blood donation?

   A. Ensuring donors are fully informed about the donation process and risks.

   B. Paying donors for their time and effort in blood donation.

   C. Providing donors with refreshments after donation.

   D. Offering incentives like free health check-ups to donors.

5. A 20-year-old woman wants to donate blood for the first time in Malaysia. Her weight is 46 kg, and her hemoglobin level is 10.0 g/dL. Based on the eligibility criteria, what action should she take?

   A. Wait for at least another year before donating.

   B. Donate blood immediately as she meets the age requirement.

   C. Wait until the hemoglobin level increases further before donating.

   D. Gain at least 2 kg before donating.

6. A potential male donor in Malaysia recently received a tattoo twelve months ago. What action should he takes to comply with the blood donation eligibility criteria?

   A. Undergo a medical examination to verify eligibility.

   B. Wait an additional six months before donating.

   C. Proceed with donation since twelve months have passed.

   D. Donate only after ensuring no visible signs of infection at the tattoo site.

7. What is the primary purpose of irradiating blood products?

   A. To prevent transfusion-associated graft-versus-host disease (TA-GVHD).

   B. To prevent the transmission of infectious diseases.

   C. To increase the shelf life of the blood product.

   D. To reduce the risk of febrile non-hemolytic reactions.

8. Irradiated blood products are specifically recommended for _____.

   A. patients with chronic kidney disease

   B. neonates receiving intrauterine transfusions

   C. individuals with sickle cell disease

   D. patients with acute myocardial infarction

9. Which of the following is an advantage of electronic crossmatching compared to manual methods?

   A. Ensures compatibility without antibody screening.

   B. Reduces turnaround time for issuing blood units.

   C. Reduces the laboratory device training.

   D. Eliminates the need for any crossmatching procedures.

10. In which scenario would molecular typing be preferred over serologic typing in blood bank testing?

    A. Initial ABO and Rh typing of blood samples.

    B. Determining compatibility for blood transfusions.

    C. Typing blood donors with weak antigen expressions.

    D. Screening for general blood group antigens.

11. Which of the following advantages makes gel card systems suitable for routine blood bank testing?

    A. Very sensitive to weak reactions.

    B. No need for temperature control.

    C. No manual cell washing is required.

    D. Can be performed without centrifugation.

12. Which of the following is the main benefit of integrating both barcode and radio-frequency identification (RFID) technologies in blood banks?

    A. Enhance shelf life of blood products.

    B. Real-time tracking of blood products.

    C. Increase patient data safety.

    D. Reduce compliance with regulatory standards.

13. Which of the following is a common cause of pre-analytical discrepancies in ABO blood grouping?

    A. Incubation of the test at the wrong temperature.

    B. Incorrect patient identification or sample labelling.

    C. Insufficient washing of red cells during testing.

    D. Use of outdated reagents.

14. What would be the expected blood group for the following blood grouping testing?
    Refer Below - Figure1 : The outcome of a blood grouping testing .

Anti-H Lectin	Anti-A	Anti-B	Anti-AB	Anti-D	A Cell	B Cell	O Cell
0	0	0	0	0	4+	4+	4+

Figure 1: The outcome of a blood grouping testing

    A. Classical Bombay RhD positive

    B. Classical Bombay RhD negative

    C. Classical Parabombay RhD negative

    D. Parabombay RhD negative

15. Why are Anti-A and Anti-B antibodies (primarily IgM) considered clinically significant in transfusion medicine?

A. IgM antibodies have wide thermal reactivity.

B. IgM antibodies are the most abundant antibodies.

C. IgM antibodies are only significant in RhD negative individuals.

D. IgM antibodies are not reactive at body temperature.

16. Which immunodominant sugar is associated with the H antigen?

A. Fucose

B. Sialic acid

C. D-Galactose

D. N-Acetylgalactosamine

17. In the Fisher-Race system, the antigen combination 'ce' is represented by which notation in the Wiener terminology?

A. R_1

B. R_o

C. r

D. r ''

18. Weak D antigen expression can be detected by _____test.

A. microcolumn gel agglutination

B. anti-human globulin

C. direct Coombs

D. solid phase

19. How should a blood donor with a Weak D phenotype be classified within the donor population?

A. As Rh-negative

B. As Rh-null

C. As Rh-variant

D. As Rh-positive

20. What would be the expected notation in the Wiener terminology for the following Rh phenotyping test?
Refer Below - Figure2 : A result of Rh phenotyping test .

Anti-C	Anti-c	Anti-D	Anti-E	Anti-e
4+	0	4+	4+	4+

Figure 2: A result of Rh phenotyping test

A. R1RZ

B. R1R1

C. R1R2

D. R1r

21. Which blood group provides resistance to *Plasmodium vivax* malaria?

A. Duffy

B. Lewis

C. Kidd

D. Kell

22. The antibodies in the Kidd blood group system are notorious for causing _____ reactions.

A. anaphylaxis

B. febrile non-hemolytic

C. immediate hemolytic transfusion

D. delayed hemolytic transfusion

23. Which blood group antigens are destroyed by enzymes like papain and ficin?

A. Kell

B. Rh

C. Kidd

D. Duffy

24. Which of the following antibodies commonly demonstrates the dosage effect?

A. Anti-Jka (Kidd)

B. Anti-Lea (Lewis)

C. Anti-K (Kell)

D. Anti-Lu (Lutheran)

25. What is the first step in the pre-transfusion testing process?

A. Antibody screen

B. Crossmatch

C. Direct antiglobulin test (DAT)

D. ABO and Rh typing

26. What does a positive antibody screen in pre-transfusion testing indicate?

A. The recipient has no antibodies.

B. The recipient has no previous exposure to blood antigens.

C. The recipient may have alloantibodies against transfused antigens.

D. The recipient has normal alloantibodies levels.

27. Which of the following is evaluated during a crossmatch test in pre-transfusion testing?

A. Compatibility between recipient's plasma and donor's red cells.

B. Compatibility between donor's plasma and donor's red cells.

C. Compatibility between donor's plasma and recipient's red cells

D. Compatibility between recipient's plasma and recipient's red cells.

28. Why is it important to consider a patient's transfusion history in pre-transfusion testing?

A. To detect previous sensitization to specific antigens.

B. To track previous pregnancies.

C. To assess nutritional status.

D. To avoid cross-contamination.

29. Given that a hospital crossmatched 200 units of blood and transfused 180 units, what is the Crossmatch-Transfusion Ratio (CT Ratio)?

A. 1.10

B. 1.25

C. 1.00

D. 0.90

30. Which blood type is prioritized as Emergency O?

A. O- RhD positive

B. O- RhD Positive and O- RhD Negative (in certain western countries)

C. O- Rh null

D. O- RhD negative

31. Which of the following is an immune cause of platelet refractoriness?

A. Platelet storage at improper temperatures.

B. Bleeding due to hypersplenism.

C. Fever due to infection.

D. Anti-HLA antibodies in the recipient.

32. A 25-year-old blood donor tested negative for HIV using standard serology tests. However, the donor was in the early stage of infection. Which advanced screening method could detect the infection during the window period?

A. Enzyme-linked immunosorbent assay (ELISA)

B. Flow cytometry WBC differential

C. Nucleic acid testing (NAT)

D. Blood culture testing

33. A patient with positive DAT testing (anti-IgG and anti-C3d) undergoes eluate testing. The eluate shows reactivity against the patient's own cells and all panel cells tested. What do the findings suggest in this case?

A. The presence of cold autoantibodies in the plasma.

B. The presence of complement-mediated hemolysis.

C. The presence of warm autoantibodies coating the red cells.

D. The presence of drug-induced immune complex.

34. A patient with symptoms of hemolysis has a DAT result showing negative IgG and positive C3d. What do the findings suggest in this case?

A. Indicates an isolated IgG-mediated immune response.

B. Shows no immune-mediated involvement in the hemolysis.

C. Suggests IgM-mediated immune hemolysis.

D. The result is invalid and the DAT must be repeated.

35. Which of the following is a common indication for performing an intrauterine transfusion?

A. Maternal autoimmune thrombocytopenia

B. Fetal growth restriction

C. Fatal hemolytic anemia

D. Gestational hypertension

36. Which blood component is most commonly used for intrauterine transfusion (IUT)?

A. Packed red blood cells

B. Cryopreserved platelets

C. Fresh whole blood

D. Fresh frozen plasma

37. What is the primary objective of quality control in blood banking?

A. To improve donor eligibility criteria.

B. To increase the shelf life of blood products.

C. To control the cost of blood products.

D. To ensure the accuracy and reliability of testing processes.

38. Why is the supplier qualification essential in blood banking?

A. To eliminate the need for regular audits.

B. To simplify the procurement process.

C. To reduce the cost of blood products.

D. To ensure the quality for blood-related products.

39. Why is equipment validation crucial for quality assurance in blood banking?

A. To maintain accuracy and reliability in blood testing.

B. To increase the variety of equipment used in blood banks.

C. To streamline the procurement process.

D. To ensure equipment aesthetics meet industry standards.

40. Which of the following elements will enhance the competency of blood bank staff?

A. Training and continuing education programs.

B. Additional third-party audits.

C. Implementation of full automation.

D. Annual mandatory blood donation.

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

A neonate is admitted to the neonatal intensive care unit (NICU) due to severe jaundice and anemia shortly after birth. The mother has no prior history of Rhogam administration. The doctor orders laboratory tests, including blood grouping and Coombs test for the neonate and the mother. The given figure shows the obtained results.
With reference to the given information, answer the following questions.
Refer Below - Figure3 : The results of blood grouping and Coombs test .

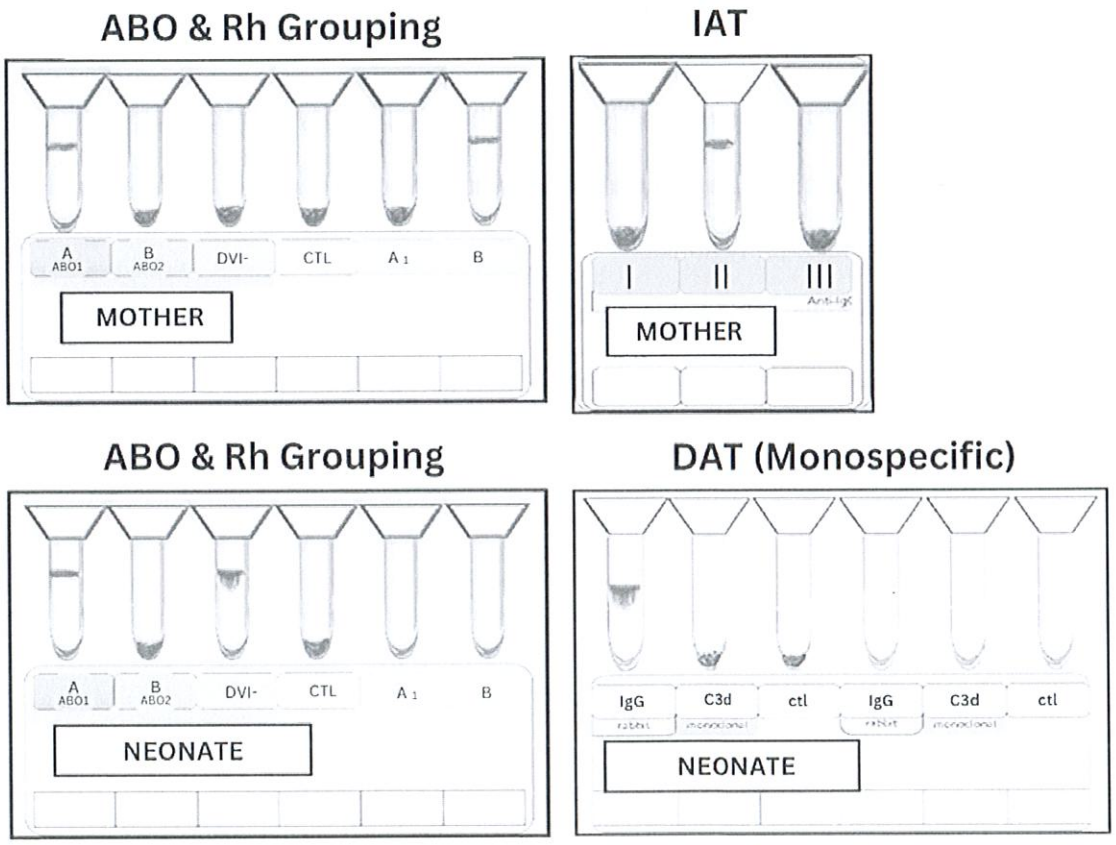

Figure 3: The results of blood grouping and Coombs test

(a) Based on the obtained results, record the correct grading according to the example table provided below:
Refer Below - Table1 : The gel card agglutination grading .

(6 marks)

Table 1: The gel card agglutination grading

Patient	Anti-A	Anti-B	Anti-D	CTL	Cell A1	Cell B	IAT	DAT
Mother								
Neonate								

(b) Identify the blood group of the mother and her neonate.

(2 marks)

(c) Suggest the most likely disease or condition of the neonate.

(2 marks)

(d) Explain how the incompatibility leads to severe jaundice and anemia in neonate.

(5 marks)

(e) What actions should be taken if the control microtube on an ABO/Rh grouping gel card shows a positive reaction?

(2 marks)

(f) Briefly explain the Rhogam and its mechanism of action.

(3 marks)

Question 2

A 45-year-old male patient is admitted for elective surgery. Routine pre-transfusion testing reveals a positive antibody screen. The following lab results were obtained during ABO/Rh typing, antibody screening, and antibody identification:

- Table A: ABO & Rh Typing
- Table B: Antibody Detection Test (Screen)
- Table C: Antibody Identification Panel

The patient is scheduled to receive a transfusion before surgery, and the lab must confirm the presence of antibodies and determine appropriate blood units.

Based on the provided details, answer the following questions.

Refer Below - Table2 : The obtained results of ABO/Rh typing, antibody screening, and antibody identification .

Table 2: The obtained results of ABO/Rh typing, antibody screening, and antibody identification

Table A: ABO and Rh Typing

Forward (Cell) Typing				Reverse (Serum) Typing	
Anti-A	Anti-B	Anti-AB	Anti-D	A1 Cells	B Cells
0	4+	4+	4+	3+	0

Table B: Antibody Detection Test (Screen)

	RH						MNS				LU		P	Kell		Duffy		Kidd		LISS		
	D	C	E	c	e	f	M	N	S	s	Lu^a	Lu^b	P_1	K	k	Fy^a	Fy^b	Jk^a	Jk^b	IS	37°C	IAT
1	+	+	0	0	+	0	+	+	+	+	0	+	+	+	+	+	+	0	+	0	0	2+
2	+	0	+	+	0	0	+	0	+	0	0	+	+	0	+	0	+	+	0	0	0	0
3	0	0	0	+	+	+	0	+	0	+	0	+	0	0	+	0	+	+	+	0	0	0

Table C: Antibody Identification Panel 1 (LISS Tube Method)

	RH						MNS				LU		P	Kell		Duffy		Kidd		LISS		
	D	C	E	c	e	f	M	N	S	s	Lu^a	Lu^b	P_1	K	k	Fy^a	Fy^b	Jk^a	Jk^b	IS	37°C	IAT
1	+	+	0	0	+	0	+	+	+	+	0	+	+	0	+	0	+	+	+	0	0	0
2	+	+	0	0	+	0	+	+	+	0	0	+	0	0	0	+	+	+	+	0	0	1+
3	+	0	+	+	0	0	0	+	+	+	0	+	0	0	0	+	+	0	+	0	0	1+
4	+	0	0	+	+	+	+	+	0	+	0	+	+	+	0	0	0	0	+	0	0	0
5	0	+	0	+	+	+	+	+	0	+	0	+	+	+	0	+	0	+	0	0	0	2+
6	0	0	+	+	+	+	+	+	+	+	0	+	+	0	+	0	+	+	+	0	0	0
7	0	0	0	+	+	+	+	+	0	+	0	+	+	+	0	0	+	0	+	0	0	0
8	0	0	0	+	+	+	+	+	+	+	0	+	0	0	+	+	0	+	0	0	0	2+
9	0	0	0	+	+	+	+	0	+	0	0	+	+	+	0	0	+	+	+	0	0	0
10	0	0	0	+	+	+	0	+	0	+	0	+	+	0	+	+	0	0	+	0	0	3+
11	+	+	0	0	+	0	+	+	+	+	0	+	0	+	0	0	+	+	+	0	0	0
AC																				0	0	0

(a) Based on Table A, state the ABO & Rh blood group of the patient.

(2 marks)

(b) Based on Table B and C, identify the most possible antibody or antibodies.

(3 marks)

(c) Explain four characteristics of the identified antibody or antibodies.

(4 marks)

(d) Explain the "Rule of Three in Antibody Identification".

(5 marks)

(e) Suggest a confirmatory test to validate the identified antibody or antibodies, state the principle or law underlying the test, and describe the expected results.

(3 marks)

(f) If the patient requires a blood transfusion, what type of packed red cell units should be supplied?

(3 marks)

Question 3

A blood bank receives a whole blood donation from a 25-year-old female donor. The blood is separated into several blood components. Each component is labelled and stored according to specific guidelines.
Based on the provided details, answer the following questions.

(a) Compare four types of blood donor.

(8 marks)

(b) State two types of blood donations that could be performed at a blood centre.

(2 marks)

(c) Justify the importance of separating whole blood into different blood components.

(4 marks)

(d) Compare three blood components based on their compositions and clinical uses.

(6 marks)

Question 4

A 29-year-old man was rushed into surgery following a traumatic accident resulting in intra-abdominal bleeding. During surgery, he experienced massive blood loss at an estimated rate of 200 ml/minute, totaling over 4 liters of blood loss. The surgical team implemented a massive transfusion protocol (MTP) to manage his condition.
Based on the provided details, answer the following questions.

(a) Describe the massive transfusion protocol (MTP) and its importance in managing the patient's condition.

(4 marks)

(b) List four blood components that should be included in a balanced transfusion strategy during massive hemorrhage and explain their purpose or function.

(8 marks)

(c) Suggest the recommended ratio for these blood components in a massive transfusion strategy.

(2 marks)

(d) Explain the pathophysiology of three complications associated with massive transfusion.

(6 marks)

END OF EXAMINATION PAPER