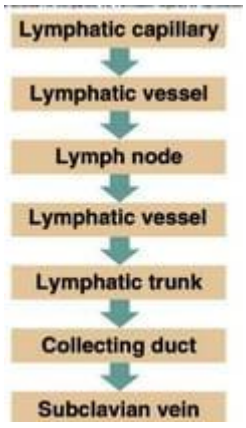
MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

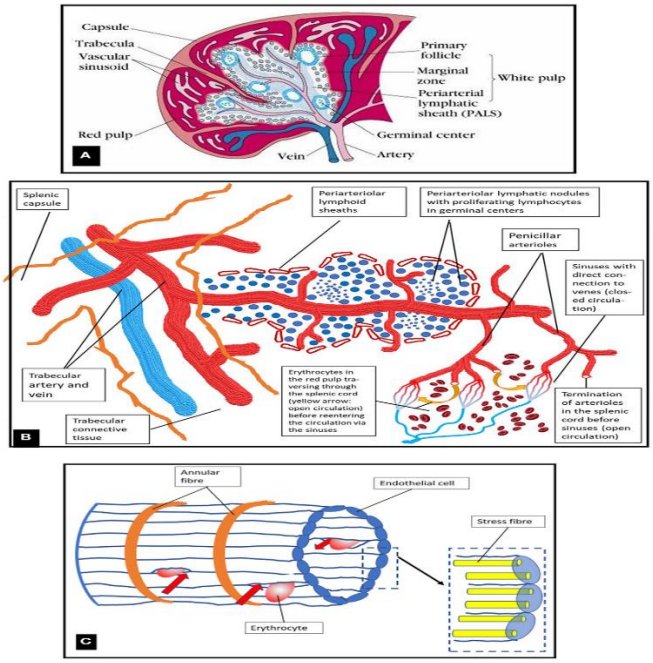
SEMESTER B.TECH. END SEMESTER EXAMINATION 2024

SUBJECT: IMMUNOTECHNOLOGY

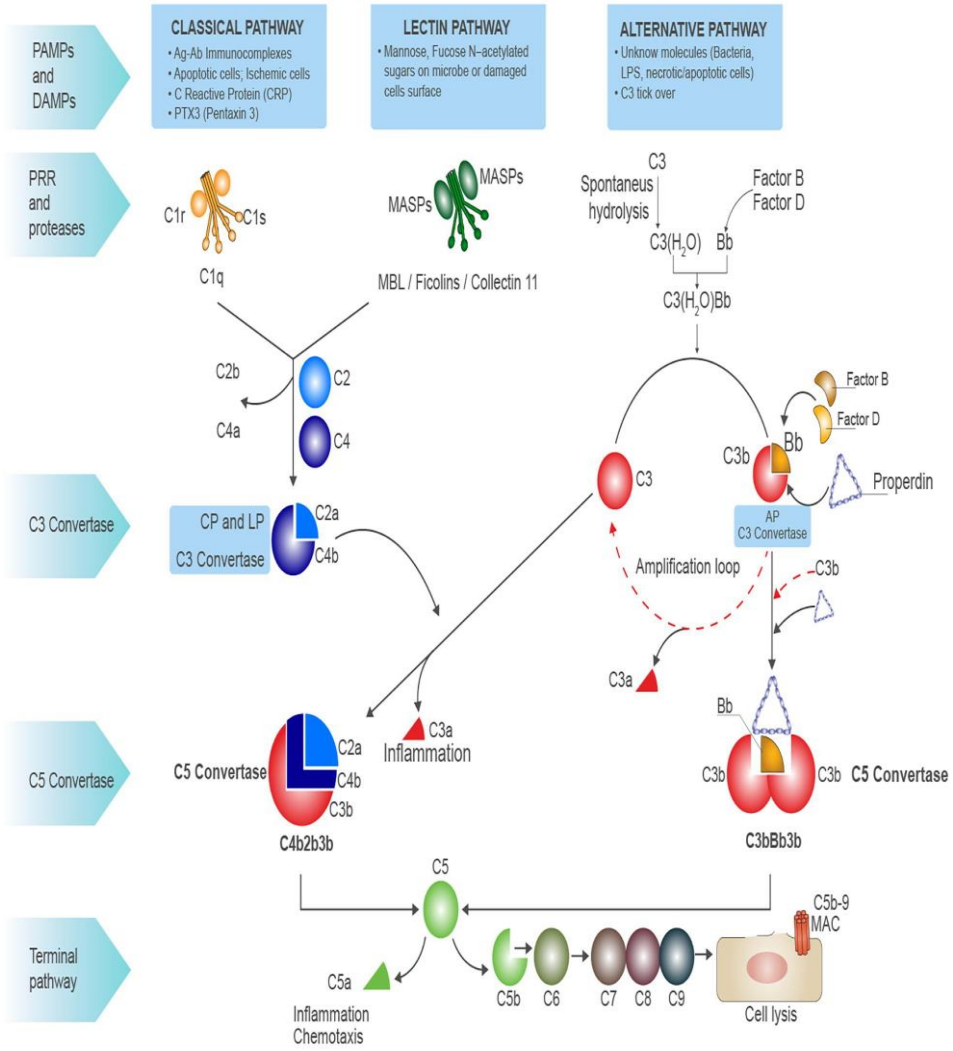
[BIO 4057]

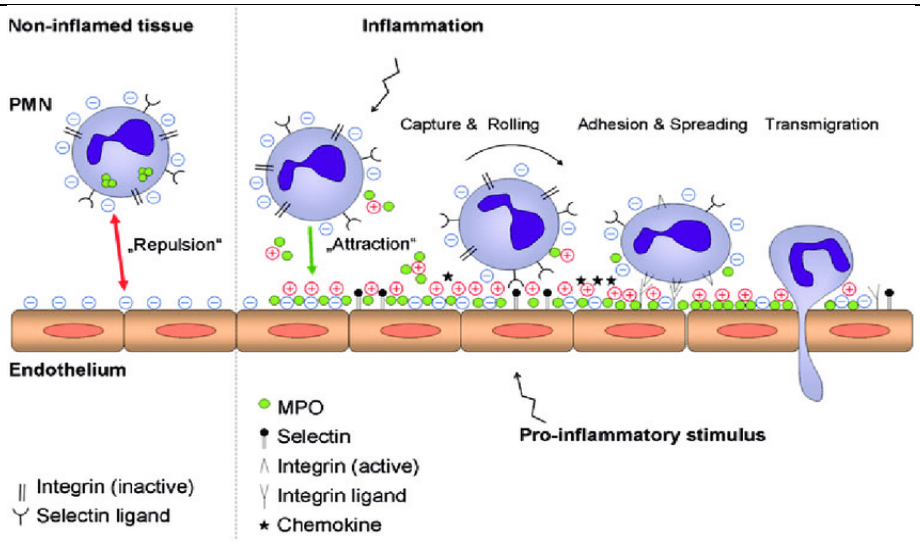
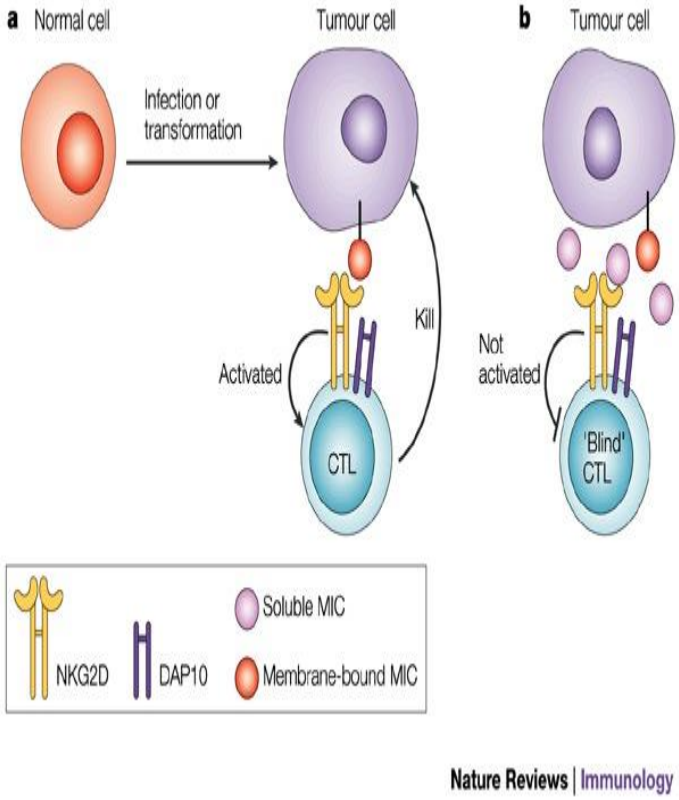
Date of Exam: 06.05.24 **Time of Exam:2:30-5.30** **Max. Marks: 50**

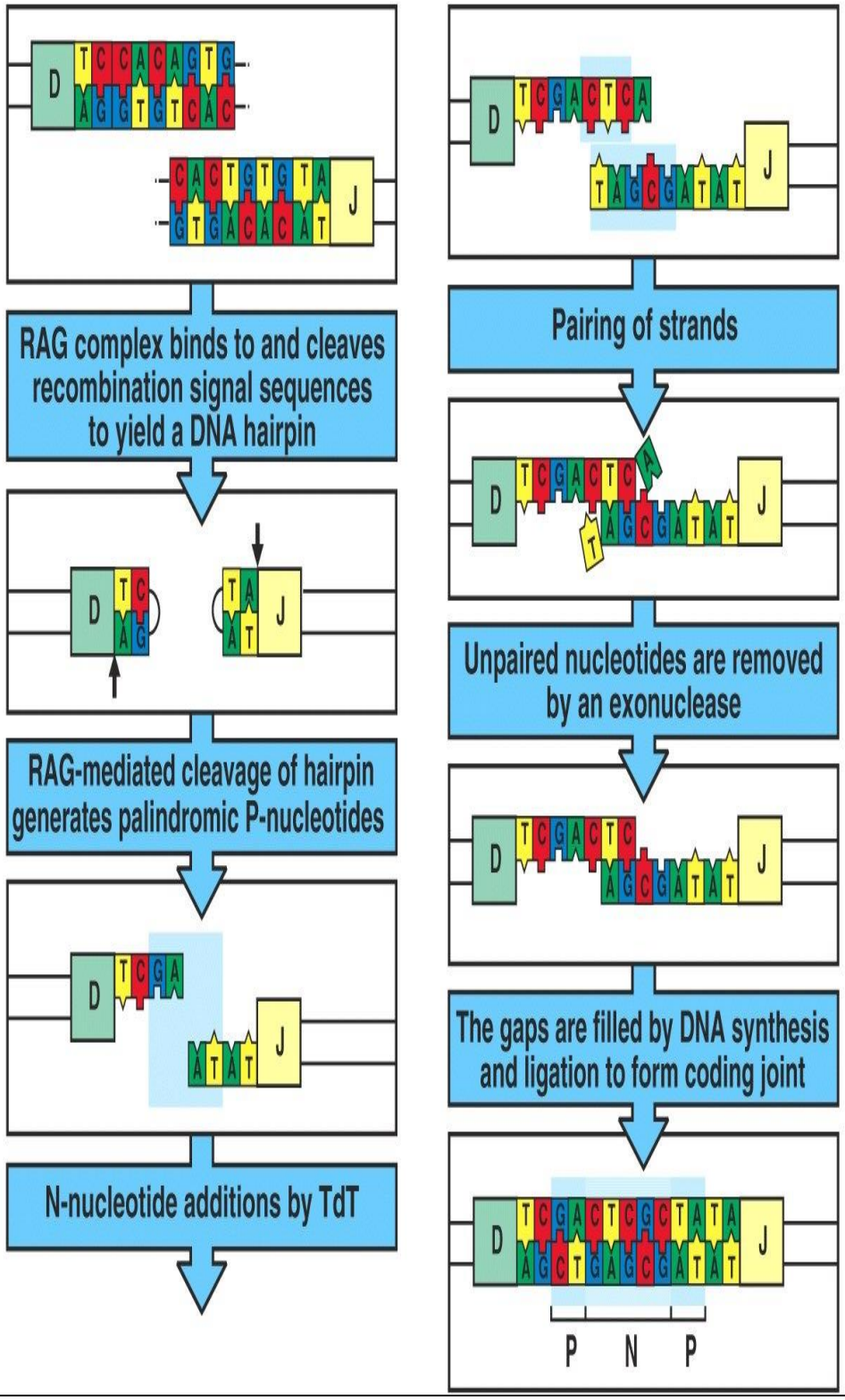
Q. No.	Questions	Marks
1A	The femoral artery, responsible for transporting blood to structures in the lower limb, experienced a leakage in its arterial wall at a particular site. i) How might this affect the lymphatic system? ii) What consequences might it have on the surrounding tissue? Name one molecule implicated in this condition. ANSWER: The leakage would result in increased eedema and inflammation. The role of the lymphatic circulation of returning the fluid volume back to the heart will be impaired. As it is the artery where the leakage is observed, the impact would be felt on the neighbouring tissues and organs as well. The molecule that would be upregulated will be IL-6, TNF-a	**4**
1B	i) The lymphatic system operates without a pump. Use a flowchart to illustrate how movement occurs within this system. 	**3**

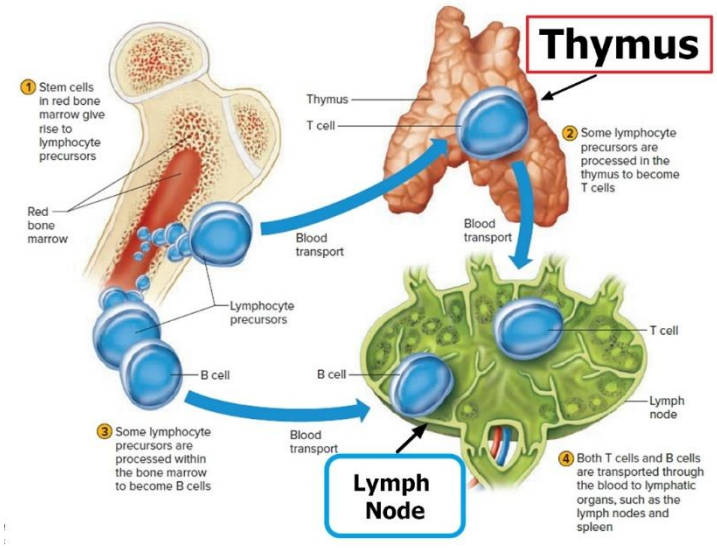
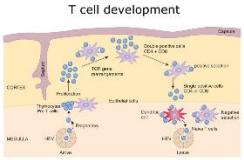
	ii) When examining an immunohistochemistry slide of a macrophage, how would you determine its activity level, distinguishing between active and passive states. The incidence of heterochromatin which is the compressed nuclear material indicates the dormant stage while euchromatin and more cytoplasmic material signifies the active cell	
1C	The primary screening of antigens within the bloodstream occurs in the spleen. Utilize a flowchart or diagram to illustrate the processes occurring in the spleen. 	**3**
2A	i) Children delivered via C-section show an increased propensity for allergies. Comment ANSWER: Babies born via C-section miss out on this initial exposure to the mother's microbiota. Instead, they are colonized primarily by the skin and environmental microorganisms present in the operating room. It was also observed that the concentration of the Tregs were also found to be reduced which are crucial for suppressing excessive immune responses ii) During menopause, women experience a heightened occurrence of autoimmune disorders.	**4**

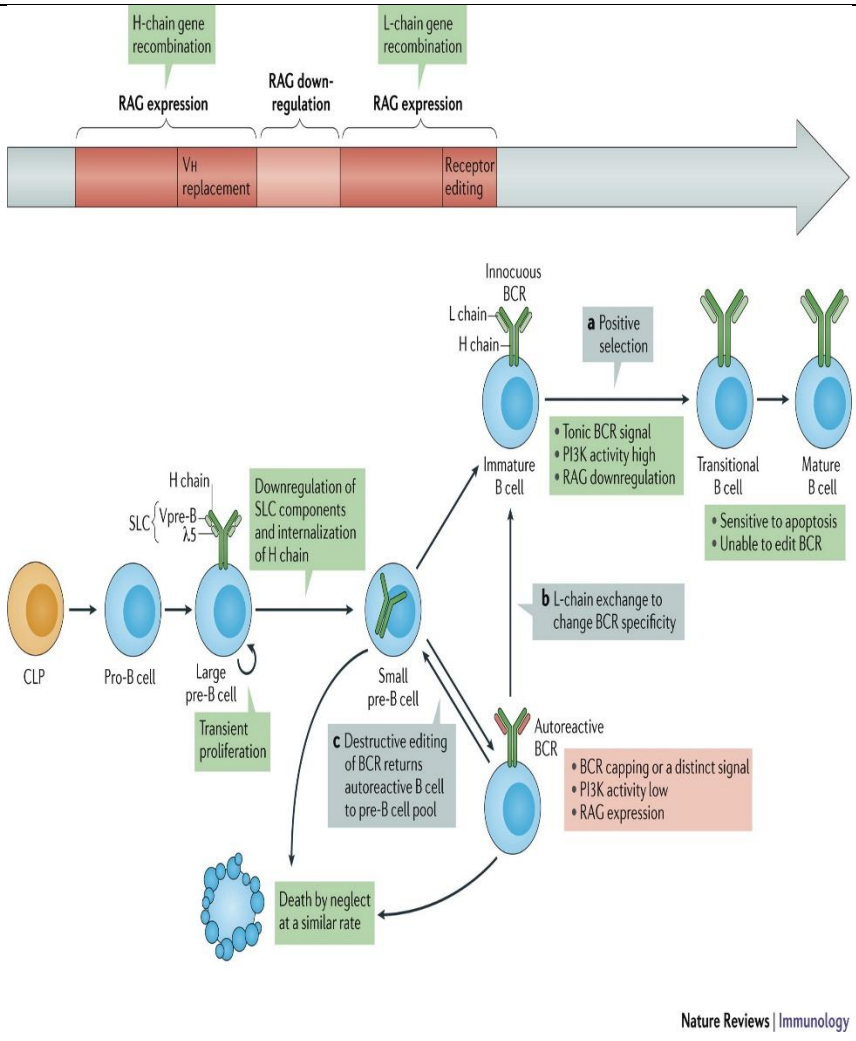
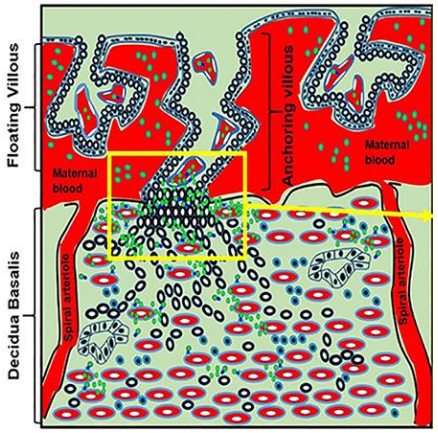
	A lot of autoimmune conditions can be pinned to autoreactive B cells and T cells. As it turns out the activation of b cells is dependent on T cells. Hence there might be chances that some self reactive T cells can go unnoticed. This might be due to underactive AIRE, a protein responsible for the priming of T cells against most of the self-protein.	
2B	What sets allo- and autografts apart? Under what circumstances might patients receive immunosuppressants, and what rationale governs this prescription? ANSWER: The most common ways to obtain tissue are either to obtain the tissue from elsewhere within your body or to take that tissue from a donor. Tissue that is obtained from your own body is called autograft. When tissue is taken from a donor, it is called allograft. The clinician would prescribe immunosuppressants in the case of allografts. This is due to rapid identification of the foreign antigen with the allograft.	**3**
2C	As cells age, they undergo apoptosis as part of the regular clearance process. Consider the involvement of the complement system in this mechanism. What might serve as the priming molecule for activating the complement pathway in this scenario, and which pathways would subsequently be activated? Illustrate	**3**

	this process using a flowchart.  	
3A	Prakhyat exhibited obsessive-compulsive disorder, characterized by rubbing his elbows against the table when stressed. This behavior led to swelling, particularly during exams. Use a diagram to illustrate the condition, highlighting the sentinel cells and their products responsible for the swelling.	**4**

		
3B	Tumor cells originate from our own body's cells that have undergone mutations and have managed to evade surveillance mechanisms. What mechanisms does our body employ to monitor and control mutated cells? 	**3**
3C	In the VDJ recombination undertaken by the BCR during their development, how does the joints result in the creation of variability? (diagrammatically only)	**3**

		
4A	The development of T-cells initiates in the bone marrow and concludes in the thymus. Illustrate this process diagrammatically.	**4**

	 lymphoid origin. Depict usin  g a diagram, the development of the T cells starting from the bone marrow and culminating in the thymus.	
4B	The presence of Mycobacterium leprae can lead to a critical outcome based on either a Th1 or Th2 response. What are the distinctions between these two responses, and what factors determine their activation? *Mycobacterium leprae,* a pathogen which infects and causes leprosy. Depending on the Th1 response which is cellular or Th2 response which is humoral, the Lepromatous Leprocy or Tuberculoid Leprocy can result where the former is Th2 response and the latter is Th1. The clearance of the pathogen is faster in Th1 , hence the fatality rate is also low.	**3**
4C	B-cells are produced in the bone marrow before migrating to peripheral tissues. How do they move from the systemic circulation into peripheral tissues? While some B-cells undergo deletion, others differentiate into either IgM or IgG antibody-producing cells. Create a diagram to illustrate this decision process.	**3**

		
5A	Zika virus triggered a significant outbreak in Brazil, impacting the fetuses of infected pregnant women. Offer a hypothesis on why the virus affects the fetus and its transmission from the mother. Additionally, discuss potential sites or molecules to limit the spread of Zika virus within the body.  The virus gets transmitted through the umbilical cord connecting the mother to the foetus. This transmission is possible due to the receptors present on the chord for the virus	**4**
5B	During college, Patient F experimented with various drugs, including intravenous substances, and shared a needle with a friend. Concerned about potential HIV exposure, the patient seeks testing. The clinician recommends ELISA testing but	**3**

	presents two options: Direct and Indirect, causing confusion for the patient. Illustrate the distinctions between the two types of ELISA diagrammatically. Which type would be more suitable for this patient? Provide justification for your choice. ANSWER: In a direct elisa only one antibody is used—this single antibody is conjugated directly to the detection enzyme. The indirect elisa requires two antibodies—a primary antibody and an enzyme-linked secondary antibody that is complementary to the primary antibody. The indirect ELISA method has high sensitivity since more than one labeled secondary antibody can bind the primary antibody; it is more economical than the direct ELISA as fewer labeled antibodies are needed.	
5C	The clinician suspected that Augusta might have Lupus, an autoimmune disorder, based on her reported symptoms. What are the typical symptoms associated with Lupus? To confirm the diagnosis, the clinician opted for immunofluorescence detection. Explain the principle underlying this method. ANSWER: Fatigue Fever Joint pain, stiffness and swelling Butterfly-shaped rash on the face that covers the cheeks and bridge of the nose or rashes elsewhere on the body Skin lesions that appear or worsen with sun exposure Fingers and toes that turn white or blue when exposed to cold or during stressful periods Shortness of breath Chest pain Dry eyes Headaches, confusion and memory loss The lupus band test (LBT) is a direct immunofluorescence (DIF) technique which shows a band of localised immunoglobulins at the dermo-epidermal junction in lesional, non-sun-exposed skin of patients with both systemic and cutaneous lupus erythematosus (LE), and in perilesional skin of patients with systemic LE. Immunofluorescence (IF) is a technique that permits visualization of virtually many components in any given tissue or cell type. This broad capability is achieved through combinations of specific antibodies tagged with fluorophores. Consequently, the possible applications in research and patient care are numerous.	**3**