TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN LABORATORY TECHNOLOGY

AAB 2207: BIOMEDICAL TECHNIQUES – IMMUNOLOGY

SUPPLEMENTARY/SPECIAL EXAMINATION

SERIES: DEC 2024

TIME: 2HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (**Compulsory**) and any other **TWO** questions.

Do not write on the question paper.

SECTION A:

Question ONE

a) Define the following terms as used in Immunology (7 marks)

- ✓ **Immunoglobulin -** are glycoproteins composed of one or more units, each containing four polypeptide chains: two identical heavy chains (H) and two identical light chains (L).
- ✓ **Sensitivity**-the ability of a trial to distinguish an effective treatment from a less effective or ineffective intervention.
- ✓ **Throughput**-The quantity of information or materials that is put through a process in a specific period of time. In immunology, it can be used to describe the efficiency of laboratory procedures, such as genetic sequencing, or the number of patients seen in a clinic in a certain period of time.
- ✓ **Autoimmunity**- an immune response is generated against component or products of its own tissues treating them as foreign material and attacking them.
- ✓ **Transplantation** - the process of moving cells, tissues, or organs, from one site to another, either within the same person or between a donor and a recipient
- ✓ **Autograft** –Transplantation of cells, tissues or organs between sites within the same individual e.g. skin graft.
- ✓ **Hypersensitive reaction-** an extreme or unnecessary immune response that the body has to an antigen.

b) Explain why CD4 T cells are considered "helper" cells (2mks)

- ✓ They do not neutralize infections but rather trigger the body's response to infections.

c) State the TWO mechanisms that mediate active immunity (2 mks)

- ✓ Cell-mediated Immunity
- ✓ Humoral Immunity

d) Outline atleast any FOUR sources of type 1 hypersensitivity response (4 mks)

- ✓ food products, such as nuts, shellfish, and soy
- ✓ animal sources, such as cats, rats, or bee stings
- ✓ environmental sources, such as mold, latex, and dust
- ✓ allergic conditions, such as allergic rhinitis, allergic asthma and conjunctivitis.

e) Outline the features of acquired immunity (6 mks)

- ✓ Specificity: Our body has the ability to differentiate between different types of pathogens, whether it is harmful or not, and devise ways to destroy them.
- ✓ Diversity: Our body can detect vast varieties of pathogens, ranging from protozoa to viruses.
- ✓ Differentiate between self and non-self: Our body has the unique ability to differentiate between its own cells and foreign cells. It immediately starts rejecting any foreign cell in the body.
- ✓ Memory: Once our body encounters a pathogen, it activates the immune system to destroy it. It also remembers what antibodies were released in response to that pathogen, so that, the next time it enters, a similar procedure is followed by the body to eliminate it.

f) Outline the factors to consider when obtaining reagents for immunoassay screening (4mks)

- ✓ Quality of standards and antibodies.
- ✓ Quantity of standards and antibodies.
- ✓ Purity of standards and antibodies (when possible antibodies are affinity purified).
- ✓ Selectivity and specificity of antibodies.

g) State FIVE compatibility items for consideration during transplantation (5 mks)

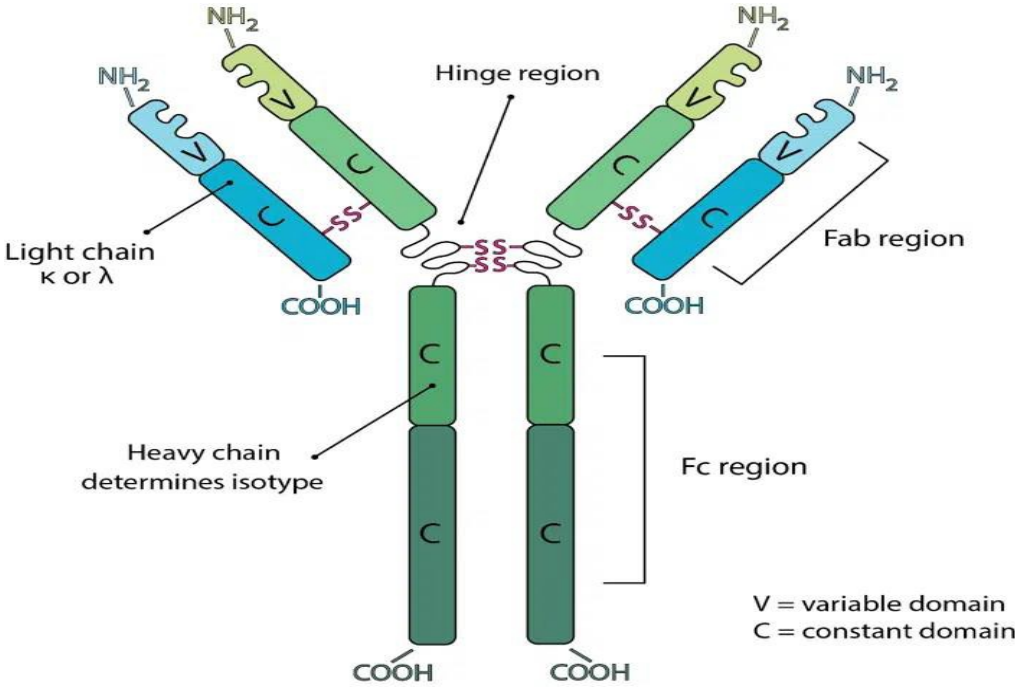
- ✓ ABO blood group compatibility
- ✓ Tissue typing
- ✓ Cross matching
- ✓ Panel reactive antibody test

✓ Serology screening

SECTION B:

Question TWO

a) Draw a well labelled diagram of immunoglobulin (15 mks)



Question THREE

a) State the TWO major types of immunity (2 mks)

✓ Innate Immunity or Natural or Non-specific Immunity

✓ Acquired Immunity or Adaptive Immunity

b) Differentiate between humoral immunity and cell mediated immunity (13 mks)

Cell-mediated Immunity	**Humoral Immunity**
It is mediated by T-cells.	It is mediated by B-cells.
No formation of antibodies.	Formation of antibodies.
Receptors are made used to identify antigens.	Antibodies are made used to identify antigens.
T-cell receptors bind to the T-cell, and the T-cells stick to the antigens.	The antibodies produced by B-cells stick to the antigen.

It protects against viruses, fungi and other intracellular bacterial pathogens.	It protects against extracellular viruses and bacteria.
It can eliminate tumour cells and thus protects against cancer.	It cannot eliminate tumour cells.
Both CD4+ and CD8+ cells participate in cell-mediated immunity.	Only TH cells participate in humoral immunity.
Mediates hypersensitivity type IV.	Mediates hypersensitivity I, II and III.
It shows a delayed response.	It is quick in response.

Question FOUR

a) Outline the similarities between B-Cell and T-cell (5 mks)

- ✓ Both B and T cells originate in the bone marrow.
- ✓ These cells are involved in adaptive immunity.
- ✓ They are a type of lymphocytes.
- ✓ The cells are nucleated and motile.
- ✓ Both protect the body's immune system and help fighting infections.
- ✓ Both the cells are non-phagocytic and are a part of lymphatic system.

b) Discuss the cells involved in innate immunity (10 mks)

- ✓ **Phagocytes**: These circulate through the body and look for any foreign substance. They engulf and destroy it defending the body against that pathogen.
- ✓ **Macrophages**: These have the ability to move across the walls of the circulatory system. They release certain signals as cytokines to recruit other cells at the site of infections.
- ✓ **Mast Cells**: These are important for healing wounds and defence against infections.
- ✓ **Neutrophils**: These contain granules that are toxic in nature and kill any pathogen that comes in contact.
- ✓ **Eosinophils**: These contain highly toxic proteins that kill any bacteria or parasite in contact.
- ✓ **Basophils**: These attack multicellular parasites. Like the mast cells, these release histamine.
- ✓ **Natural Killer Cells**: These stop the spread of infections by destroying the infected host cells.
- ✓ **Dendritic Cells**: These are located in the tissues that are the points for initial infections. These cells

sense the infection and send the message to the rest of the immune system by antigen presentation.

Question FIVE

a) State clinical stages of rejection (3 mks)

- ✓ Hyperacute rejection
- ✓ Acute rejection
- ✓ Chronic rejection

b) Discuss the mechanism of rejection of grafts un transplantation (12 mks)

Mechanism of rejection

- ✓ Graft rejection occurs when the recipient's immune system attacks the donated graft and begins destroying the transplanted tissue or organ. The immune response is usually triggered by the presence of the donor's own unique set of HLA proteins, which the recipient's immune system will identify as foreign.
- ✓ The degree of similarity between the HLA genes of the donor and recipient is known as histocompatibility; the more genetically compatible the donor and the recipient, the more tolerant the recipient's immune system should be of the graft. However, unless the donor and recipient are genetically identical (e.g. as in identical twins) there will always be some degree of rejection. As well as non-self HLA proteins, other surface proteins on the donor graft can also be identified as a foreign antigen and illicit an immune response.
- ✓ In some cases, a patient may experience something known as 'graft versus host reaction' where mature immune cells already present in the donor graft begin attacking the healthy cells of the recipient. Graft versus host reaction, where the donor graft is described as being "immune-competent" (i.e. capable of producing an immune response) is a particular risk with stem cell transplants (bone marrow transplant) and can also occur following blood transfusions.