



All questions are to be answered

(1): Define and mention the functions of the following: 12 mark

- i. Macrophages.
- ii. Peripheral (2ry) lymphoid tissues.
- iii. Epitopes.
- iv. Complement System.

(2): Compare between the following: 12 mark

- A. Humoral and cell-mediated immunity.
- B. IgG and IgM.

(3): Give reasons for the following: 12 mark

- A. The size of antigen is important to its ability to induce an immune response.
- B. Inflammation is usually accompanied by fever.

"With my best wishes"

Dr. Mohamed Atef

4- Choose the right answer for the following sentences:

1. Most cytokines have more than one biological activity is known as
a) Antagonism b) Synergy
c) Pleiotropism d) Redundancy
2. refers to a specific class of cytokines that mediates chemoattraction.

The model answer for Immunology Exam (318B) 3/9/2016

(1): Define and mention the functions of the following: 12 mark

i. **Macrophages (MQ)** are released from bone marrow as immature monocytes and mature in various tissue locations where they reside for weeks or years. They accumulate slowly at sites of infection, respond to a variety of stimuli (including lymphokines). They are active phagocytic and killer cells, working with the acquired immune system and complement to phagocytose and kill antibody or C3b-coated particles.

- Macrophages play a pivotal role in the preparation of the antigen for presentation to the lymphoid cells through digestion by its enzymes and releasing highly immunologic parts of antigen thus act as a major antigen presenting cells (APCs). They aid in the initiation and coordination of the immune response by producing monokines as IL-1.
- They act as depot for maintenance of the immune response.
- Important cells in delayed hypersensitivity reactions and tumor immunity.

ii. **Peripheral (2ry) lymphoid tissues.**

They include spleen, lymph nodes, mucosal associated lymphoid tissue or MALT (which includes tonsils, Peyer's patches, appendix, bronchial and mammary tissue).

Functions of 2ry lymphoid tissues:

- 1 - Trapping and concentrating foreign substances.
- 2 - Site of production of Abs and Ag specific-T cells

iii. **Epitopes** (also called antigenic determinants) are the sites either on or within the Ag with which Abs and T-cell receptors react. **Structure:** They are very small, can be linear or conformational. Some epitopes are located on the antigen's surface, whereas others are internal

Function: Epitopes determine the specificity of antigen molecule. Epitopes are able to react with their homologous antibody.

*Paratope: Antibodies are specific for epitopes, the area of Ab molecule that interacts with the epitope is called the paratope. The structure of the paratope is complementary to the epitope.

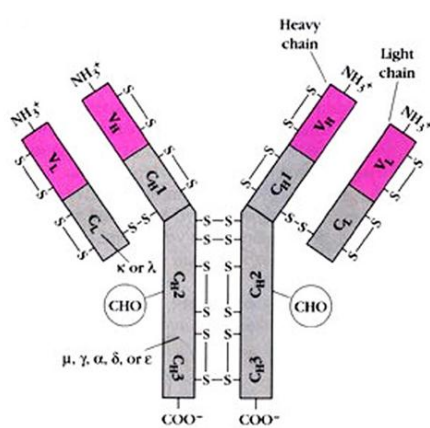
iv. **The Complement System**

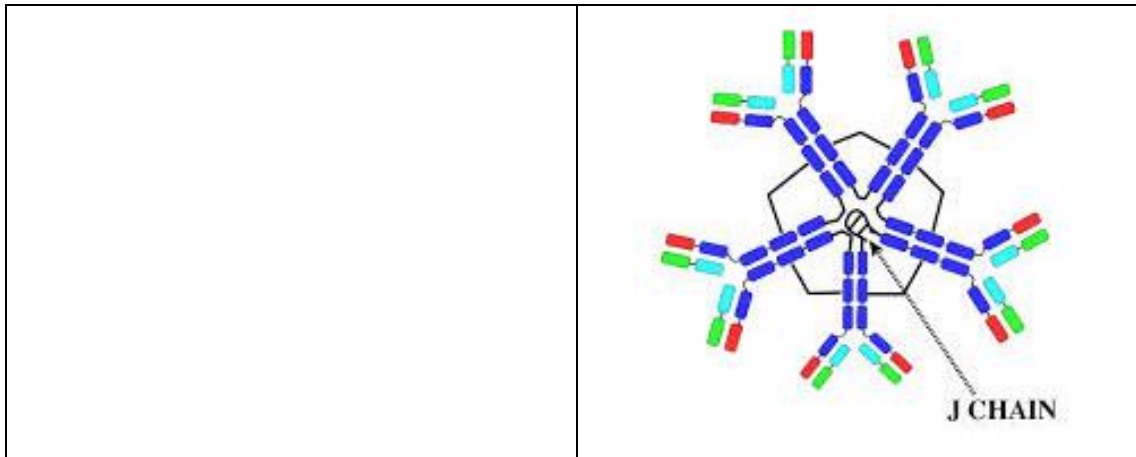
- The complement system plays a major role in host defense and the inflammatory process (through innate and acquired immunity).
- It consists of complex series of at least 25 plasma proteins (9 major proteins C1-C9) are normally functionally inactive.
- It is activated sequentially in a cascading manner, each protein activating the protein: directly follows it in sequence.
- It causes lysis of erythrocytes in hemolytic anemia, sensitizes foreign particles to phagocytosis, and causes release of histamine from mast cells.
- It is present in serum and tissue fluids except urine and CSF.
- It is present in high concentration in guinea pig sera.
- **Function**
- **1-Chemotaxis:** C5a. attracts phagocytic cells to the site of reaction and increases their activity.
- **2-Anaphylatoxin:** C3a & C5a, stimulate the release of mediators of inflammation from mast cells and basophils leading to dilatation of blood vessels and increased capillary permeability with influx of more Abs and C to control the inflammatory reaction.
- **3-Opsonization:** C3b coats the participate Ag, render it more attractive to phagocytes that have receptor for C3b.
- **4-Cytotoxic or cytolytic effect:** C8 & C9 lyse the cell by nonenzymatic process similar to the membrane damage caused by the perform secreted by NK cells and Tc cells

(2): Compare between the following:

12 mark

Humoral immunity.	Cell-mediated immunity.
<p>Humoral immunity or humoural immunity is the aspect of immunity that is mediated by macromolecules found in extracellular fluids such as secreted antibodies, complement proteins, and certain antimicrobial peptides. Humoral immunity is so named because it involves substances found in the humors, or body fluids.</p>	<p>Cell-mediated immunity is an immune response that does not involve antibodies, but rather involves the activation of phagocytes, antigen-specific cytotoxic T-lymphocytes, and the release of various cytokines in response to an antigen.</p>

IgG	IgM.
<p>It is the major Ig in the human serum (75% of total normal serum Ig pool) at a concentration of 1200 mg/dl.</p> <p>Structure:</p> <ul style="list-style-type: none"> • IgG is a monomer (identical pairs of H & L chains linked by disulfide bonds). • Four subclasses have been identified (IgG1, IgG2, IgG3, IgG4) .which correspond to H chains γ_1, γ_2, γ_3 & γ_4. • Most serum IgG is IgG1. • Most IgG has half-life of about 21 days; IgG3 has a half-life of only 7 days, <p>Function:</p> <ul style="list-style-type: none"> • All IgG subclasses with exception of IgG2 can cross the placenta in humans. Therefore, maternal IgG provides most of the protection of the newborn during the 1st months of life. • It is the major Ab produced in the 2ry IR. • It has antitoxic immunity. • It is the major opsonising Ig in phagocytosis. • IgG, except IgG4 binds complement by the classical pathway 	<p>It represents about 8-10% of the total serum Ig; it is present in normal serum at a concentration of 120 mg/dl.</p> <p>Structure:</p> <p>IgM has a pentameric structure (5 monomeric units linked by a J chain and by disulfide bonds in the Fc fragment).</p> <p>Function:</p> <ul style="list-style-type: none"> • IgM is the 1st Ab that an immunologically committed B lymphocyte can produce. • IgM is the predominant Ab in the Iry IR to most Ags. • It dose not cross the placenta so, an elevated IgM in the cord serum of a newborn (Normal level =10 mg/dl) indicates fetal infection before birth. IgM has a serum half-life of about 10 days. • IgM is the only Ab made to certain carbohydrate Ags, such as the ABO blood group" Ags (natural isohemagglutinins). • Being mainly present intravascularly it protects against bacteraemia. • IgM is the most efficient Ig at activating complement in lytic actions. • It enhances phagocytosis by complement activation



(3): Give reasons for the following:

12 mark

A. The size of antigen is important to its ability to induce an immune response

Usually, the larger the molecule, the better the immunogen because

- The number and variety of epitopes increase proportionately with the size of the protein.
- Larger molecules are easily phagocytized with the result of antigen processing and antibodies formation. Also molecules must be susceptible to intracellular catabolism within the phagocytic cell. Antigens that are difficult or impossible to be phagocytized are nonimmunogenic, e.g., polystyrene particles.

B. Inflammation is usually accompanied by fever because

1- Bacterial products (endotoxin of gram-negative bacteria).

2- Endogenous pyrogens (IL-1, TNF) produced by monocytes and macrophages.

4.

12 mark

1. C
2. D
3. B
4. A
5. C
6. C
7. D
8. D
9. B
10. B
11. D
12. C