**Final-Term Assignment**

**Course Title: Human Physiology II**

**Rad 2nd semester section A**

**Instructor: Dr. M .Shahzeb khan (PT)**

 **Marks: 50**

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**Note:**

* **Attempt all questions, all questions carry equal marks.**
* **Answer Briefly and to the point, avoid un-necessary details**

**Q1:** (A) How stimulus of smell moves from nostril to brain? Make a Diagram as well.

**ANSWER**

**SENSE OF SMELL:**

* Sense of smell called Olfaction.
* The organ that is responsible for the sense of smell in the nose.
* The cavity of the nose is lined with mucous membranes.
* These mucous membranes have smell receptors connected to the olfactory nerve.
* The smells themselves consist of vapours of various substances.
* The sense of smell might get temporarily lost when a person has a cold.

**PHYSIOLOGY OF SMELL:**

* The sense of smell is a chemical sense.
* They are called chemical senses because they detect chemicals in the environment,
* The floating vaporized odour molecules in the air reach the nostrils and dissolve in the mucous.
* The mucous is on the roof of each nostril.
* Underneath the mucous, in the olfactory epithelium, specialized receptor cells called olfactory receptor neurons are present.
* These are responsible for detecting the odour.
* These neurons are capable of detecting thousands of different odours.
* The olfactory receptor neurons transmit the information to the olfactory bulbs, which are located at the back of the nose.
* The sensations are carried from the olfactory bulbs through olfactory tract to olfactory area in the temporal lobe of cerebral cortex.
* These brain centres then perceive odours.
* The brain centres in response also access memories to remind us about places, people and events that are associated with that smell.



**Q 2:** (A) What iS the difference between Haemostasis, Haematopoiesis and Homeostasis.

**ANSWER**

**HAEMOSTASIS:**

Haemostasis is defined as arrest or stoppage of bleeding.

**Stages of Haemostasis:**

It occurs in three stages.

* Vasoconstriction
* Platelet plug formation
* Coagulation of blood.

**HAEMATOPOIESIS:**

It is the process of formation of blood cells i.e. RBC’S, WBC’S and platelets.

The sites where it occurs are known as hemopoietic tissues or organs that includes bone marrow, liver, spleen.

**HEMATOPOIETIC STEM CELLS:**

* Cells responsible to do the function of hemopoiesis are first seen in the yolk sac of embryo in the third week of embryonic development.
* These cells are called hematopoietic stem cells.

**HOMEOSTASIS:**

Homeostasis is the state of steady internal, physical, and chemical conditions maintained by living systems.

Homeostasis is the ability to maintain a relatively stable internal state that persists despite changes in the world outside.

All living organisms must regulate their internal environment to process energy and ultimately survive.

**DIFFERENCE:**

The difference between Haemostasis, Haematopoiesis and Homeostasis is that:

* Haemostasis is stopping of the blood flow in animals.
* Whereas the process of haematopoiesis is the production of human blood cells, regulation and maintenance.
* And Homeostasis is the balance between cellular growth and death, including human blood cells.

 (B) What is Erythroblastosis fetalis?

**ANSWER**

**ERYTHROBLASTOSIS FETALIS:**

* Erythroblastosis fetalis is a disease common in a fetus and new-born child.
* It is characterized by agglutination and phagocytosis of the fetus’s red blood cells.

**CAUSE OF THE DISEASE:**

* In most cases, the mother is Rh-negative and the father Rh-positive.
* The baby inherits the Rh-positive antigen from the father, and the mother develops anti-Rh agglutinins from exposure because of Rh-antigen present in the baby.
* In turn, the agglutinins of the mother diffuse through the placenta into the fetus that would cause red blood cell agglutination.

**SIGN AND SYMPTOMS:**

Symptoms and signs in the fetus due to Erythroblastosis fetalis are :

* Enlarged liver spleen, or heart.
* Fluid build-up in the abdomen of the fetus.

Symptoms and signs in the newborn:

* Anaemia that creates the newborn baby appears to be pale in color.
* Causes yellow discolouration of the skin of a newborn baby.
* Enlargement of the liver and spleen.
* Severe oedema of the body.
* Difficulty breathing.

**Q3:** (A) What is Immunity? Explain different types of immunity.

**ANSWER**

**IMMUNITY:**

* Immunity is the ability of the body to protect against all types of foreign bodies which enter the body.

Foreign bodies include bacteria, virus, toxic substances etc.

* Immunity is done by the immune system which is a complex network of lymphoid organs such as bone marrow, thymus, spleen etc.

**DISEASE RESISTANCE**

* As it protects us from diseases it is also called disease resistance.

**SUSCEPTIBILITY**

* Lack of immunity is known as susceptibility.

**TYPES OF IMMUNITIES:**

* Human immunity is divided into two types:
1. Innate immunity
2. Acquired immunity

**INNATE IMMUNITY**:

* It’s a natural resistance that a person is born with.
* It is genetically inherited.
* It is also called natural or native immunity.
* It consists of mechanisms that exist before infection and is capable of rapid responses to microbes.
* It acts as the first line of defence against infections, microorganisms, their products before they cause disease.

**TYPES OF INNATE IMMUNITY:**

Innate immunity has three types

1) Species Immunity

2) Racial Immunity

3) Individual Immunity.

**ACQUIRED IMMUNITY:**

* Acquired or adaptive immunity is the immunity that is developed by the host in its body after exposure to suitable antigen.
* Also after the transfer of antibodies or lymphocyte from an immune donor.

**TYPES OF ACQUIRED IMMUNITY**

* Acquired Immunity is of two types which are :
1. Active immunity
2. Passive immunity

(B) What is difference between Antigen and Antibody?

**Answer**

**DIFFERENCE BETEEWN ANTIBODY AND ANTIGEN:**

* Antibodies are proteins that defend the body against pathogens by binding to antigens on the surface of these pathogens and stimulating their destruction.
* Antigens are foreign substances which stimulate the production of antibodies.
* Antibodies usually only bind to one specific antigen.
* Antigens are molecules capable of stimulating an immune response.
* Each antigen has distinct surface features, or epitopes, resulting in specific responses.
* Antibodies are Y-shaped proteins produced by B cells of the immune system in response to exposure to antigens.

**Q4:** (A) Write down different functions of Antibody.

**ANSWER:**

**FUNCTIONS OF ANTIBODY:**

1. **PHAGOCYTOSIS:**

It plays a key role in the process of phagocytosis.

1. **NEUTRALIZATION OF INFECTIVITY**:

It neutralizes the spread of infection.

1. **COMPLEMENT-MEDIATED LYSIS OF PATHOGENS**:

Antibodies activate the complement system to destroy bacterial cells by lysis

ADCC is independent of the immune [complement system](https://en.wikipedia.org/wiki/Complement_system) that also lyses targets but does not require any other cell.

1. **CYTOTOXICITY:**

Antibody-dependent cellular.

 (B) Write difference between Primary and secondary response to an antigen.

**ANSWER**

**DIFFERENCE BETWEEN PRIMARY AND SECONDARY RESPONSE:**

* **OCCURRENCE:**
* The primary response occurs as a result of primary contact with an antigen, whereas the secondary response occurs as a result of second and subsequent exposure of the same antigen.
* **RESPONDING CELLS:**
* Responding cell of primary response is naïve B-cell and T-cell.
* Responding cell of secondary is memory cell
* **LAG PHASE:**
* Lag phase of primary response is often longer, about 4-7 days, sometimes as long as weeks or months.
* Whereas the Lag phase of secondary response is shorter, about 1-4 days due to the presence of memory cell
* **LEVEL:**
* Level of antibody in primary response reaches peak in 7 to 10 days.
* Level of antibody in secondary reaches peak in 3 to 5 days
* **TIME PERIOD:**
* It takes a longer time to establish immunity in primary response.
* Takes shorter time to establish immunity in secondary.
* **FIRST ANTIBODY PRODUCED:**
* First antibody produced in primary is mainly IgM.
* In secondary response mainly IgG antibody is produced. Although sometimes small amount of IgM are produced.

**Q5:** Write difference between cell mediated and Antibody Mediated Immunity.

**ANSWER**

**CELL MEDIATE IMMUNITY:**

* The cell mediated immunity is the second line of defence.
* It is the main defence against intracellular bacteria

**PHYSIOLOGY OF CELL MEDIATE IMMUNITY:**

* Mycobacterium tuberculosis enters the body that is ingested by Macrophage.
* The Bacterium is broken down and the antigen or epitopes appear on the surface of macrophage.
* The antigen-class II MCH protein complex interacts with a specific antigen receptor on the surface of helper T lymphocyte.
* Activation of the antigen-specific helper T cell occur as result of the production of interleukins.
* These activated helper T cell, are helped by activated macrophages and these cells mediate one important component of cellular immunity specifically against Myco Bacterium tuberculosis.

**ANTIBODY MEDIATED IMMUNITY:**

Antibody synthesis typically involves the cooperation of three cells

1. Macrophage
2. Helper T cells
3. B cells

**DIFFERENCE:**

The difference between cell mediate and antibody mediated immunity is the :

* The cell mediate immunity is is the second line of defence and antibody mediated immunity is third line of defence.
* Also, the cell mediate immunity is defence against intracellular bacteria, whereas antibody mediated immunity is the main defence against extracellular encapsulated pyogenic bacteria like staphylococci and streptococci.