**FINAL TERM ASSIGNMENT**

**COURSE TITLE: HUMAN PHYSIOLOGY**

**RADIOLOGY 2ND SEMESTER SECTION A**

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**Q1.HOW STIMULUS OF SMELL MOVES FROM NOSTRIL TO BRAIN? MAKE A DIAGRAM AS WELL.**

**Ans) SENSE OF SMELL:**

* The special sense responsible to chemical stimuli is the sense of the smell or olfaction.
* The nose is the organ responsible for the sense of smell.
* The olfactory receptor neurons are incorporated into a limited region of the nasal epithelium in the superior nasal cavity.
* In each nostril, the olfactory membrane has a surface area of about 2.4 square cm.
* Smell is the one sensory modality that does not require a synaptic connection in the thalamus before connecting to the cerebral cortex.
* It can trigger visceral reflexes through connection within the reticular formation.

**WAYS TO DETECT ODOURS:**

* **Orthonasal olfaction:**  In the air we breathe through the front of the nose.
* **Retronasal olfaction:** Through the back of our nose from our mouth, when chewing food. This is how we appreciate the flavor of food.

**COMPOSITION OF OLFACTORY EPITHELIUM:**

The olfactory epithelium consists of three types of cell.

Sensory, basal cells and substentacular.

* **BASAL CELLS:** Supporting cells, basal cells replace old and damaged olfactory receptor cells with the new olfactory cells.

 An olfactory receptor cell lifespan is 30 to 60 days.

* **OLFACTORY SENSORY CELLS:**

There are 10 to 20 million receptor cells.

Olfactory receptor cells are located in the olfactory epithelium contain bipolar neurons interposed between the substentacular cells.

Olfactory receptor cells contain 10-20 non motile cilia that extend into the fluid layer covering the epithelium in the nose. It contain receptors for sense odour.

**MUCUS PRODUCING GLANDS:**

* Olfactory mucus membrane is constantly covered by the mucus.
* Mucus is produced by Bowman’s glands.

**OLFACTORY NERVE PATHWAY:**

It is a set of nerve fibers conducting impulses from “olfactory receptors” to the “cerebral cortex”.

* **OLFACTORY SENSORY CELLS:**

Olfactory receptor cells contain 10-20 non motile cilia that extend into the fluid layer covering the epithelium in the nose. It contain receptors for sense odour.

* **OLFACTORY NERVE:**

1st cranial nerve formed out of a collection of olfactory receptor cell axons, which pass through the cribriform plate and into the roof of the nasal cavity.

* **OLFACTORY BULB:**

The axons projecting from the olfactory receptors cells through the olfactory nerve terminate within the olfactory bulb.

It is the relay station of the olfactory pathway and contains bundles of nerve fibers called olfactory glomeruli.

* **OLFACTORY TRACT:**

This bundle of nerve fibers is made up of the axons of mitral relay neurons bound for the regions of the brain associated with the olfactory cortex.

* **OLFACTORY STRIAE:**

They are the medial and lateral divisions of the olfactory tract.

The lateral striae continues on to structures associated with the olfactory cortex.

The medial striae projects to contralateral olfactory structures.

* **OLFACTORY CORTEX:**

This cortex is not a single structure, it is defined as the combined areas of the cerebral cortex that receive input directly from the olfactory bulb.

**Piriform cortex:** Located below the lateral olfactory striae that works to identify the smell.

**Amygdala:** Is associated with the emotion of fear.

**Entorhinal cortex:** It is involved in the formation of memory.

* **OLFACTORY CORTEX OUTPUT STRUCTURE:**

From the olfactory cortex, information about smell is sent to the orbitofrontal cortex through the dorsal medial nucleus of the thalamus, where it can then be integrated with taste information.

Odour information is also sent to portions of the hypothalamus and brain stem and trigger autonomic responses involved in appetite, salivation, and gastric contraction.

* **OLFACTORY SYSTEM DYSFUNCTIONS:**

Smell disorders has many causes including illness such as,

Respiratory infection, injury, sinus infections.

**ANOSMIA:** It is defined as the absence of the sense of the smell. It can be caused by infection, head injury, tumours and also due to the neurodegenerative conditions.



**Q2. A: WHAT IS DIFFERENCE BETWEEN HAEMOSTASIS, HAEMOTOPOIESIS AND HOMEOSTASIS?**

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|  **HAEMOSTASIS****DEFINITION:** It is the stopping of a flow of blood from the circulation system in animals.* It helps in the circulatory system to perfuse the right organs.
* Prevents blood loss from the circulation when a blood vessel is ruptured.
* It results in the blocking of any vascular breach.

**PHASES OF BLOOD CLOTTING:**The process of blood clotting occurs in three phases.* **VASCULAR PHASE:** Constrict the blood vessels as much as possible to decrease blood flow.
* **PLATELET PHASE:** Stick platelets to sides of torn blood vessels to patch up hole.
* **COAGULATION PHASE:** It form the final network that will full cover the hole and seal up the blood vessels.
 |  **HAEMOTOPOIESIS** **DEFINITION:** It is the production of red blood cells, white blood cells, and platelets. * It is the process through which the body manufactures blood cell.
* All the blood cellular components is derived by haematopoietic stem cells.
* HSC proliferate produce two daughter cells.1 stem cell will remain and other stem cell will produce either LSC or MSC.
* It is located at bone marrow.
* HSC has special characteristic where it can self renewing.
* They are ultimately responsible for the constant renewal of blood.
* Five types are found in haemotopoiesis.

Proerthroblast, lymphoblast, myeloblast and megakaryoblast are the first commited cells.* Regulated by a variety if factors.

**STAGES OF HEMATOPOIESIS:*** **MESOBLASTIC STAGE:** First month of embryonic life where cells are formed outside the embryo in the mesenchyme of the yolk sac.
* **HEPATIC STAGE:** By the sixth week.
* **MEDULLARY STAGE:** By the fifth month blood cell formation occurs in the bone marrow.

Bone marrow, primitive stem cells and commited progenitor cells are confined.Spleen and lymph and secondary lymphoid for lymphocytes development and differentiation.  |  **HOMEOSTASIS** **DEFINITION:** It is the tendency to maintain a relatively stable internal conditions by a system of feedback controls.* It is a mechanism by which the biological system maintains an equilibrium state.
* Maintains stable internal conditions.
* Changes do occur, but the magnitude of the changes must be small and stay with narrow limits.

**MECHANISM:** Homeostasis is achieved through negative or positive feedback mechanism.* **NEGATIVE FEEDBACK:** It includes most homeostatic control mechanism.

it shuts off the original stimulus or reduces the intensity.* **POSITIVE FEEDBACK:** It increases the original stimulus to push the variable farther.
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**B. WHAT IS ERYTHROBLASTOSIS FETALIS?**

**DEFINITION:**

* Erythroblastosis fetalis is a hemolytic anemia in the fetus.

**CAUSE:**

* It is caused by trans-placental transmission of maternal antibodies to fetal RBCs.
* Erythroblastosis is the disease of the fetus and newborn child characterize by agglutination and phagocytosis of the fetus red blood cells.

**Rh INCOMPATIBILTY:**

* In most instances of erythroblastosis fetalis, the mother is Rh positive and the father Rh negative.
* RBCs from the fetus can go into the mother’s blood stream through the placenta.
* Rh negative mother’s immune system treats the Rh positive fetal cells as a foreign substance and makes antibodies against them.
* Theses anti Rh antibodies may cross the placenta into the fetus, where they destroy the fetus circulation red blood cells.
* **SYMTOMS AND SIGNS IN THE FETUS:**
* Enlarged liver spleen, or heart.
* Fluid buildup in the fetus’ abdomen seen via ultrasound.
* **SYMPTOMS AND SIGNS IN THE NEWBORN:**
* Anemia that creates the newborn’s pallor (pale appearance)
* Jaundice or yellow discoloration of the newborn’s skin.

**Q3. A: WHAT IS IMMUNITY? EXPLAIN DIFFERENT TYPE OF IMMUNITY.**

**IMMUNITY:** The ability of a body which resists against diseases or pathogens is called immunity.

**TYPES OF IMMUNTY:** There are two basic types of immunity.

**INNATE IMMUNITY:**

* It is also called natural immunity.
* It is natural resistance with which a person is born. It is nonspecific which can response against all kind of infections.
* It is genetic and is inherited from mother to offspring.
* It acts as first line of defense against pathogens infections.

**TYPES OF INNATE IMMUNITY:**

There are three types of innate immunity.

* **SPECIES IMMUNITY:**

It is the total immunity shown by all members of a species against pathogens.

* **RACIAL IMMUNITY:**

It is that in which various races show marked difference in their resistance to certain infectious disease.

* **INDIVIDUAL IMMUNITY:**

It is very specific for each and every individual despite having same recial background and opportunity for exposure.

**ACCQUIRED IMMUNITY:**

* It is the type of immunity which is developed during lifetime of an individual.
* It is not present from the birth.
* It is developed by the organism in response to a disease caused by the infection or vaccine.
* Acquired immunity which has been developed may be.
* **Temporary:** the immunity which works for short time or developed only during disease.**example:** in influenza.
* **Permanent:** The immunity which works for long time against pathogens. **Example:** in measles, mumps, polio.

**TYPES OF ACCQUIRED IMMUNITY:**

**ACTIVE IMMUNITY:**

* It is a long lasting immunity developed by antibodies produces by an individual own cells.
* In this case the body immune system is stimulated to produced antibodies which produce resistance.
* Active immunity lasts for months or years and the body is protected for a long time.
* **EXAMPLE:** The infection like small pox are cured by the active function of the immune system.

**PASSIVE IMMUNITY:**

* It is a short lasting immunity in which organism itself does not produce antibodies but the antibody against specific antigen is directly injected from other source.
* It works immediately and temporary.
* **EXAMPLE:** transfer of antibodies from mother to the fetus through the placenta.

**B: WHAT IS DIFFERENCE BETWEEN ANTIGEN AND ANTIBODY?**

Ans)

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|  **ANTIGEN:*** An antigen is any substance that triggers an immune response in the body.
* It can be either proteins, carbohydrates, lipids and nucleic acids.
* It can cause either disease or allergic reactions.
* It can be cells.
* There are two main types. self antigens and non self antigens.
 |  **ANTIBODY:*** An antibody is a blood protein that is produced against a specific antigen.
* It can be glycoproteins.
* It protect the body from antigens either by immobilizing the antigen or lysing the pathogens.
* It cannot be cells.
* Five main types according to the proteins constructs IgA, IgD, IgE, IgG, IgM.
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**Q4.A. WRITE FUNCTIONS OF ANTI BODIES.**

Ans) **FUNCTION OF ANTIBODY:**

* It neutralize toxins and viruses.
* Opsonize microbes to be easily phagocytosed.
* It activate complement, and prevent attachment of microbes to mucosal surfaces.
* Antibody can act as an enzyme.
* Antibodies activate the complement system to destroy bacterial cells.

**B. WRITE THE DIFFERENCE BETWEEN PRIMARY AND SECONDARY RESPONSE TO AN ANTIGENS.**

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| **PRIMARY RESPONSE:*** Primary immune response refers to any immune response of the immune system include the production of antibodies and cell mediated immunity.
* It occurs in response to the primary contact of the antigen.
* Native B cells and T cells responed to the antigens.
* Takes a long time to establish the immune response.
* Antibody level declines rapidly.
* Appears mainly in the lymoh nodes and spleen.
 | **SECONDARY RESPONSE**:* Secondary immune response refers to any immune response of the immune system that occurs in response to the subsequent exposure to a particular antigen.
* It occurs in response to the second and subsequent exposure to the same antigen.
* Memory B cells respond to the antigen.
* Takes a short time to establish the immune system.
* Antibody level remains for long time.
* Appears mainly in the bone marrow.
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**Q.5: WRITE DIFFERENCE BETWEEN CELL MEDIATED AND ANTIBODY MEDIATED IMMUNITY.**

**ANS: DEFINITION:**

Following are the main points which display the difference between the humoral and the cell-mediated immunity

 **Cell mediated Immunity:-** Cell mediated immunity is a type of immunity that defences against intracellular pathogens

 **CELL INVOLVED:** Mainly T lymphocytes

**WORKS AGAINST :**Intracellular Pathogens

**RESPONSE :** Delayed

**MECHANISM:** Release cytokines in order to destroy cells

**ANTIBODY PRODUCTION:** Does not take place

**CYTOKINE PRODUCTION :**Take place

**IMMUNITY AGAINST CANCER CELLS:** Cell mediated immunity provide immunity against cancer cells

**ANTI BODY MEDIATED IMMUNITY :-**

 DEFINITION:- Cell mediated immunity is the type of immunity that defencs extracellular pathogens

**CELL INVOLVED:-** Mainly B lymphocytes

**WORK AGAINST:-** Extracellular pathogens

**RESPONSE:-**Rapid

**MECHANISM:-** Produce antibodies in order to neutralize antigens to phagocytic cells

**ANTIBODY PRODUCTION:-** Takes place

**CYTOKINE PRODUCTION:-** Does not take place

**IMMUNITY AGAINST CANCER CELLS:-**Antibody mediated immunity cannot provide immunity against cancer cells