Ques1: Explain about reflex action.

Answer:

Reflex Action

An inborn and rapid response to astimulus from the external environment.

•An automatic response that occurs very rapidly & without conscious control.

•An involuntary action that involve the contraction of the skeleton muscles & the spinal cord only.

Types of reflex action

2 types of reflex action:

CRANIAL REFLEX-
Brought about by nerve impulses travelling through the medulla oblongata)

SPINAL REFLEX-
Brought impulses travelling through the spinal cord.

Reflex arc

A reflex arc is the neural pathway that mediates are flex action.In higher animals, most sensory neurons do not pass directly into the brain,but synapse in the spinal cord.This characteristic allows reflex actions to occur relatively quickly by activating spinal motor neurons without the delay of routing signals through the brain.

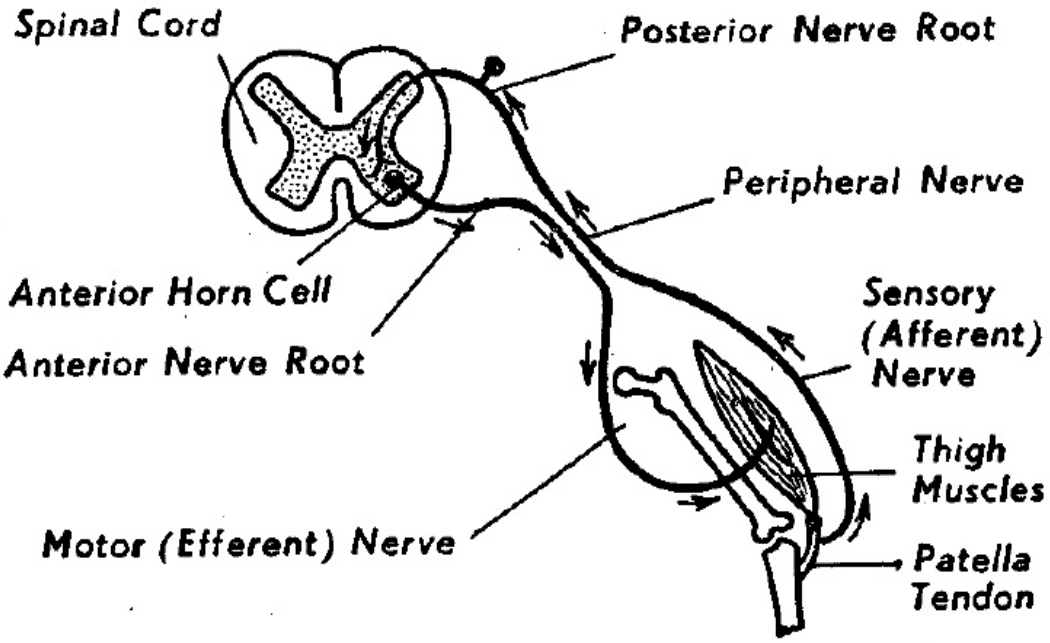
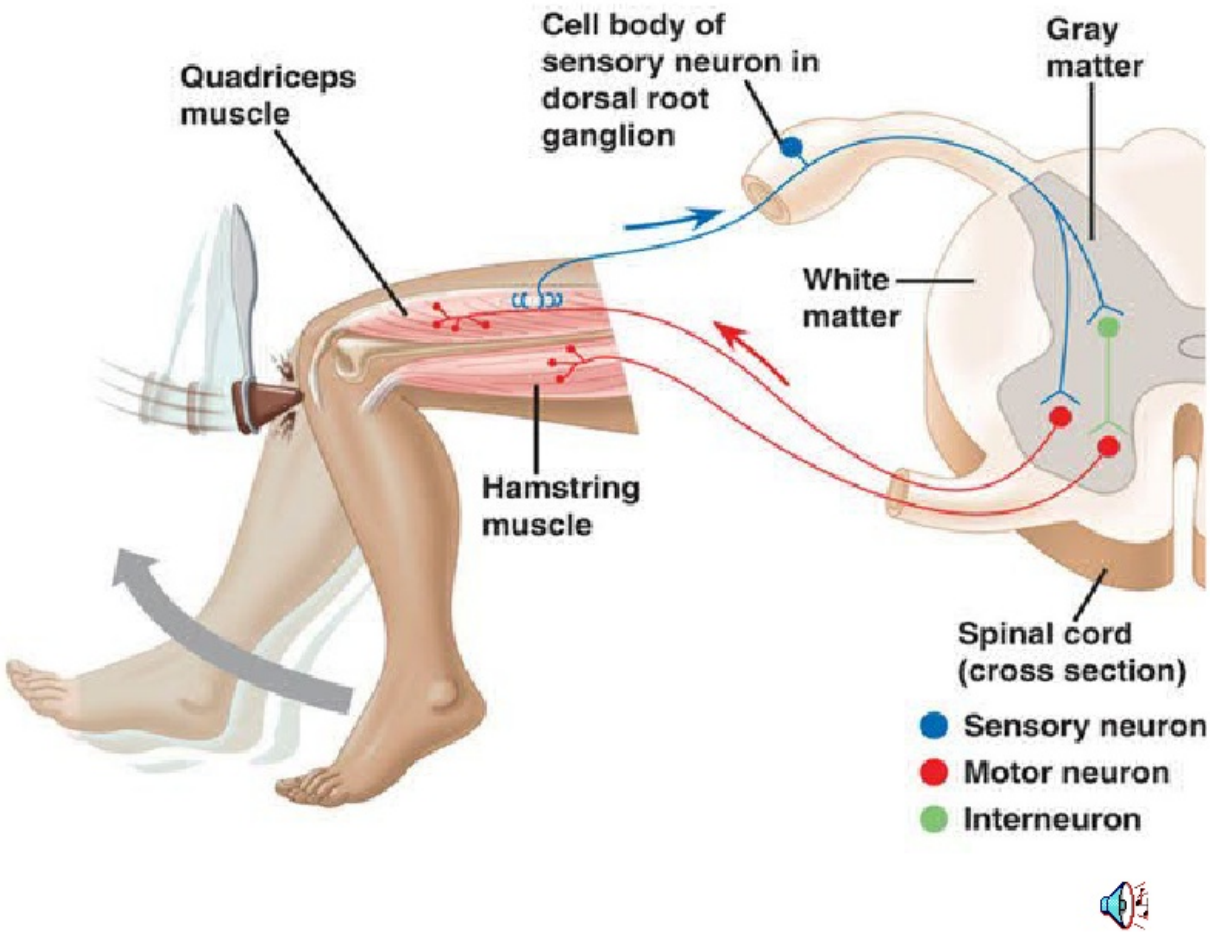


Diagram illustrating Reflex Action.

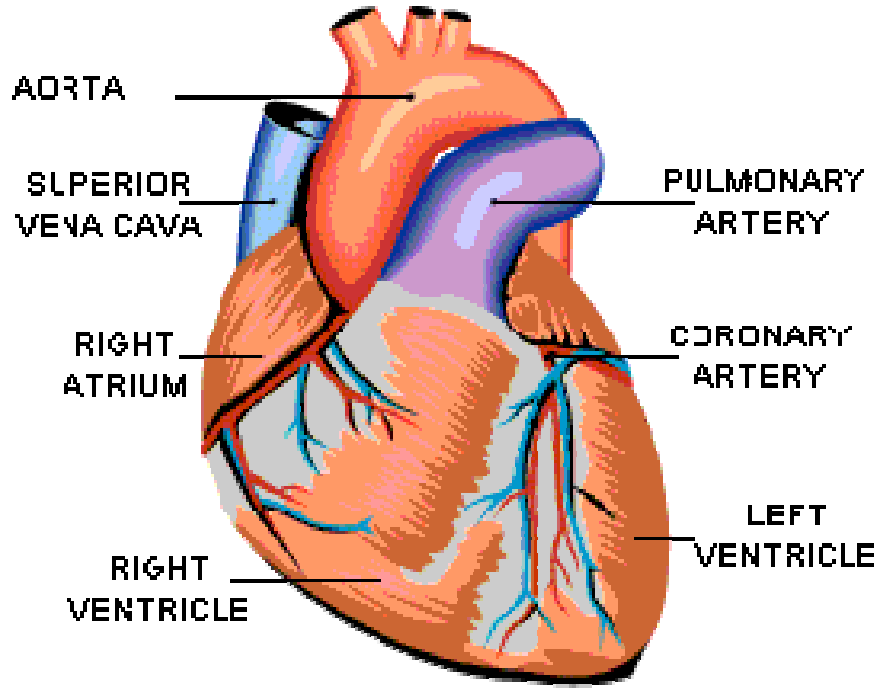
- **The Knee jerk reflex is a well known example of stretch reflex**
- **Tapping the knee cap (patella) pulls on the tendon of the quadriceps femoris, which is an extensor muscle that extends the lower leg.**
- **When the muscle stretches in response to the pull of the tendon, information regarding this change in the muscle is conveyed by the afferent sensory neurons to the spinal cord and the central nervous system.**



In the spinal cord the sensory neurons act directly on motor neurons that contract the quadriceps

Ques 2: Explain the anatomy of the human heart.

Answer:



The heart is the organ that helps supply blood and oxygen to all parts of the body. It is divided by a partition or septum into two halves, and the halves are in turn divided into four chambers. The heart is situated within the chest cavity and surrounded by a fluid filled sac called the pericardium. This amazing muscle produces electrical impulses that cause the heart to contract, pumping blood throughout the body. The heart and the circulatory system together form the cardiovascular system.

Heart Anatomy: Chambers

- **Atria - upper two chambers of the heart.**
- **Ventricles - lower two chambers of the heart.**

Heart Anatomy: Heart Wall

- **Epicardium - the outer layer of the wall of the heart.**
- **Myocardium - the muscular middle layer of the wall of the heart.**
- **Endocardium - the inner layer of the heart.**

Heart Anatomy: Cardiac Conduction

Cardiac Conduction is the rate at which the heart conducts electrical impulses. The following structures play an important role in causing the heart to contract:

- **Atrioventricular Bundle - bundle of fibers that carry cardiac impulses.**
- **Atrioventricular Node - a section of nodal tissue that delays and relays cardiac impulses.**
- **Purkinje Fibers - fiber branches that extend from the atrioventricular bundle.**
- **Sinoatrial Node - a section of nodal tissue that sets the rate of contraction for the heart.**

Heart Anatomy: Cardiac Cycle

The Cardiac Cycle is the sequence of events that occurs when the heart beats. Below are the two phases of the cardiac cycle:

- **Diastole Phase - the heart ventricles are relaxed and the heart fills with blood.**
- **Systole Phase - the ventricles contract and pump blood to the arteries.**

Heart Anatomy: Valves

Heart valves are flap-like structures that allow blood to flow in one direction. Below are the four valves of the heart:

- **Aortic Valve - prevents the back flow of blood as it is pumped from the left ventricle to the aorta.**
- **Mitral Valve - prevents the back flow of blood as it is pumped from the left atrium to the left ventricle.**
- **Pulmonary Valve - prevents the back flow of blood as it is pumped from the right ventricle to the pulmonary artery.**
- **Tricuspid Valve - prevents the back flow of blood as it is pumped from the right atrium to the right ventricle.**

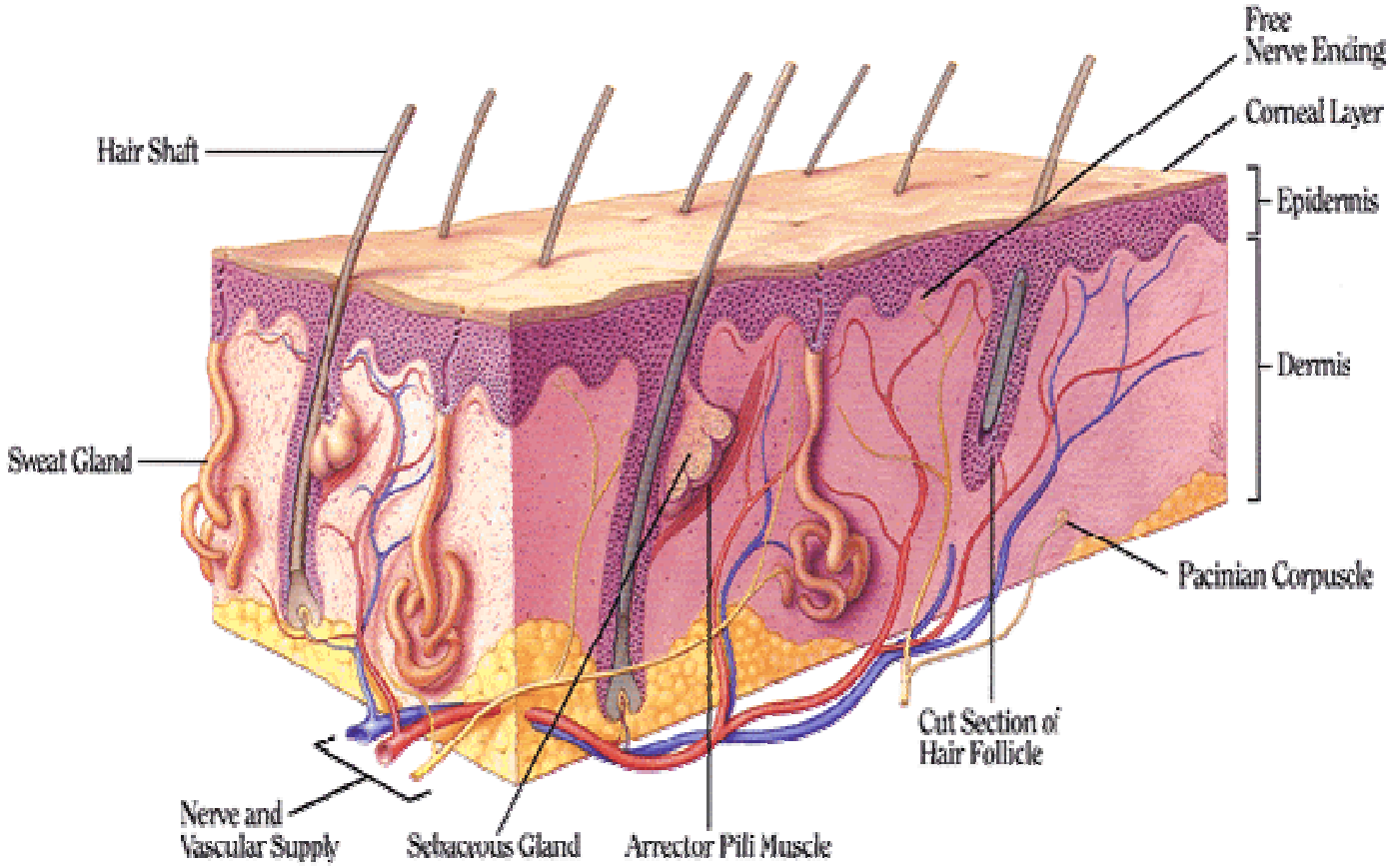
Ques 3: Explain the structure and function of skin.

Answer:

Skin Structure and Function

What It Looks Like

Skin is a waterproof, flexible, but tough protective covering for your body. Normally the surface is smooth, punctuated only with hair and pores for sweat. A cross-section of skin shows the major parts. It is divided into three layers. The outer layer is the epidermis. The dermis is in the middle and fat forms the innermost layer. Blood vessels, nerves, hair follicles, oil glands and sweat glands are located in the dermis.



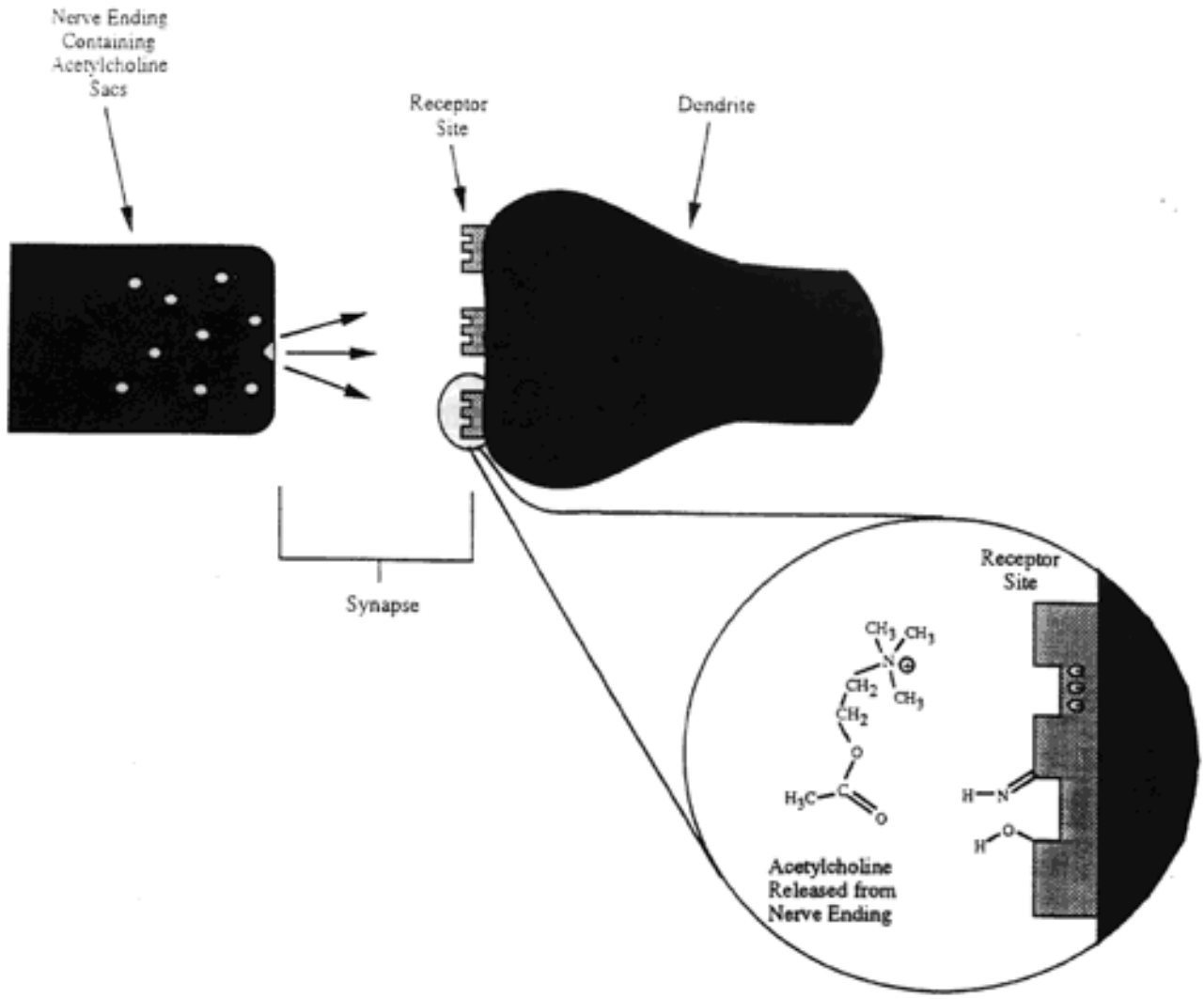
What It Does

The major function of skin is to provide a barrier between you and the outside environment. Without this protective covering, your life on earth would be impossible. The outermost layer of the epidermis is made up of sheets of dead cells that serve as the major waterproof barrier to the environment. In addition, special cells inside the epidermis produce brown pigment which helps protect you from ultraviolet light.

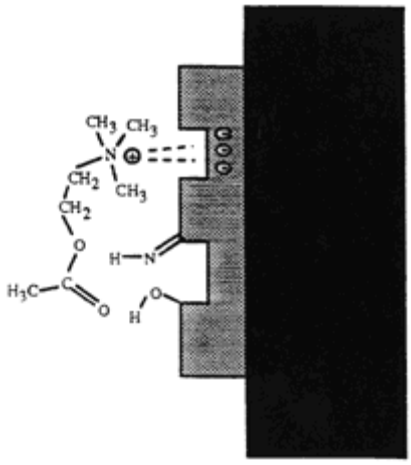
The middle layer, the dermis, provides a tough, flexible foundation for the epidermis. In the dermis, sweat glands and blood vessels help to regulate body temperature, and nerve endings send the sensations of pain, itching, touch, and temperature to the brain. Oil glands produce a substance called sebum which help to moisturize the skin. Hair is primarily decorative in humans. The fat under the dermis provides insulation and helps to store calories.

Ques 4: The Mechanism of Human Respiration in Detail
Answer:-

Human respiration is dependent upon the interaction of acetylcholine molecules with acetylcholine esterase receptors on the diaphragm muscle. Each time a person takes a breath, nerve endings that contain "sacks" of acetylcholine are stimulated. Each sack has roughly 1 x 10^{14} acetylcholine molecules inside. The sacks move toward the end of the nerve and eventually strike the wall of the nerve. The force of the collision causes the sacks to release the acetylcholine molecules into the neuromuscular junction or synapse.

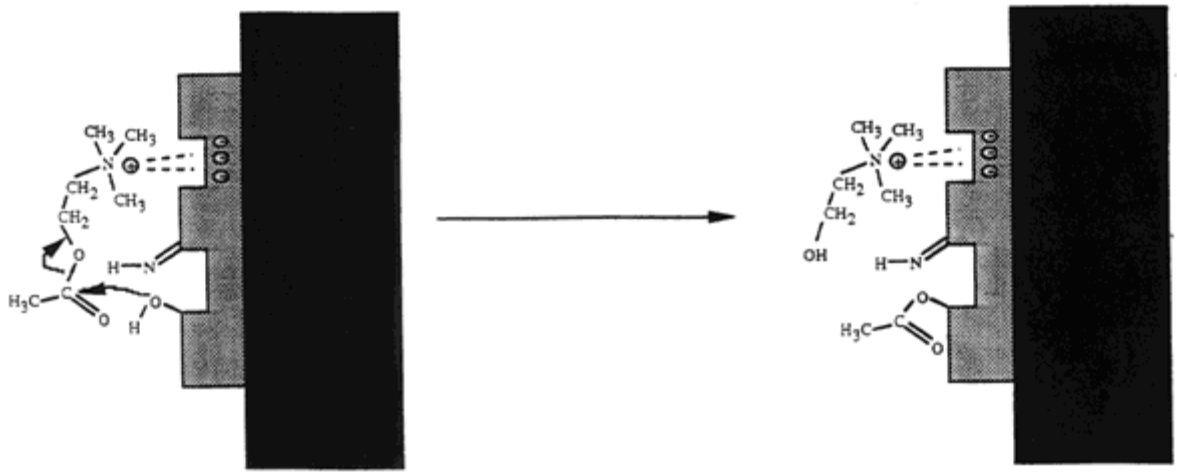


The acetylcholine molecule has a positive nitrogen group which is attracted to the negative charge of an acetylcholine esterase receptor site on the diaphragm.

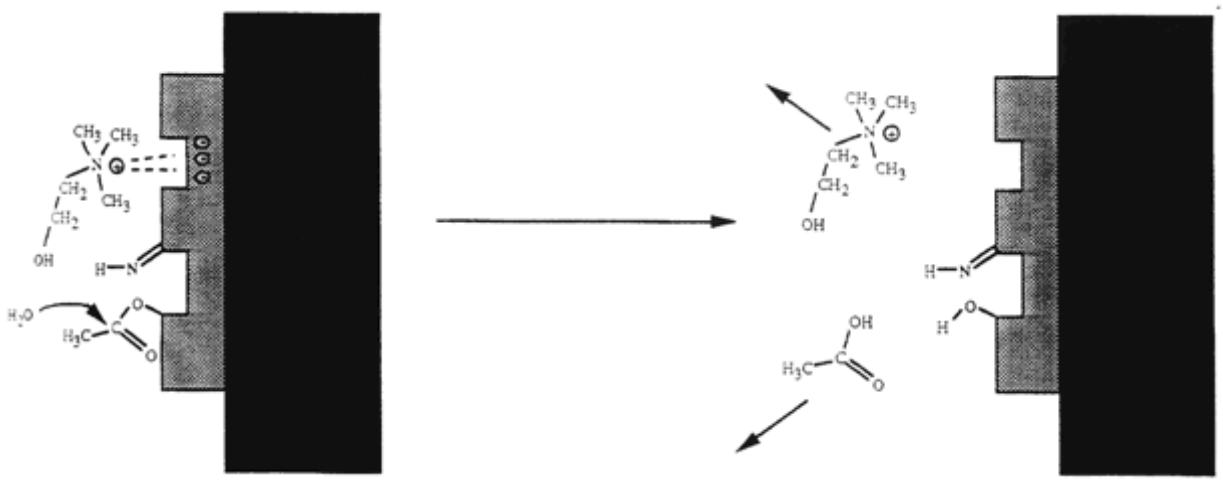


The attraction between the molecule and a receptor site causes a bridging to occur, and a channel for impulses from the nerve to the muscle is opened. Each interaction with the receptor site causes the channel to open for approximately 400 microseconds . The opening of the channel allows for the transmission of an electrical impulse that stimulates the contraction of the muscle fiber. Many of these neuromuscular interactions combine to create a uniform muscle response; i.e., a contraction of the diaphragm, which is the driving force behind human respiration. Each breath a human takes is a result of the interaction described above.

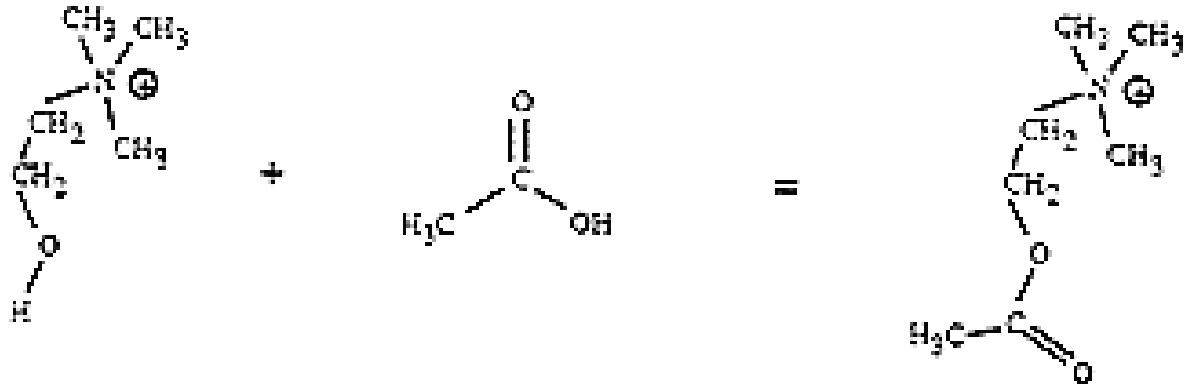
The acetylcholine molecule contains an ester group which reacts with the alcohol group of the receptor site. This reaction is responsible for the degradation of the acetylcholine molecule.



Once the molecule is broken down, a reaction with water occurs and the receptor site releases the molecules. Once the molecules are released, the impulse channel closes and the receptor site is free to interact with another acetylcholine molecule.



The molecules that are released from the receptor site are then used by the body to form new acetylcholine molecules that are again stored in the sacks in the nerve ending.



Acetylcholine Molecule

Since the body produces the acetylcholine molecule, the process is cyclic in nature and self-sustaining. The process will continue to occur until something prohibits the interaction with the receptor site and stops the formation of the acetylcholine molecule.

Ques 5: Explain the different types of joints with example.

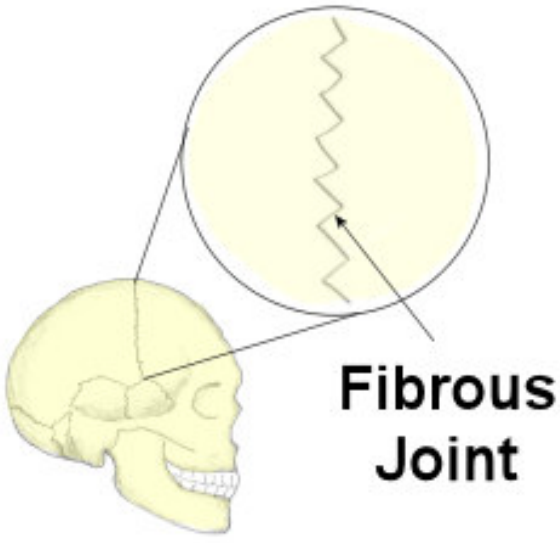
Answer:

Types of Joint

A joint is the point where two or more bones meet. There are three main types of joints; Fibrous (immoveable), Cartilagenous (partially moveable) and the Synovial (freely moveable) joint.

Fibrous joints

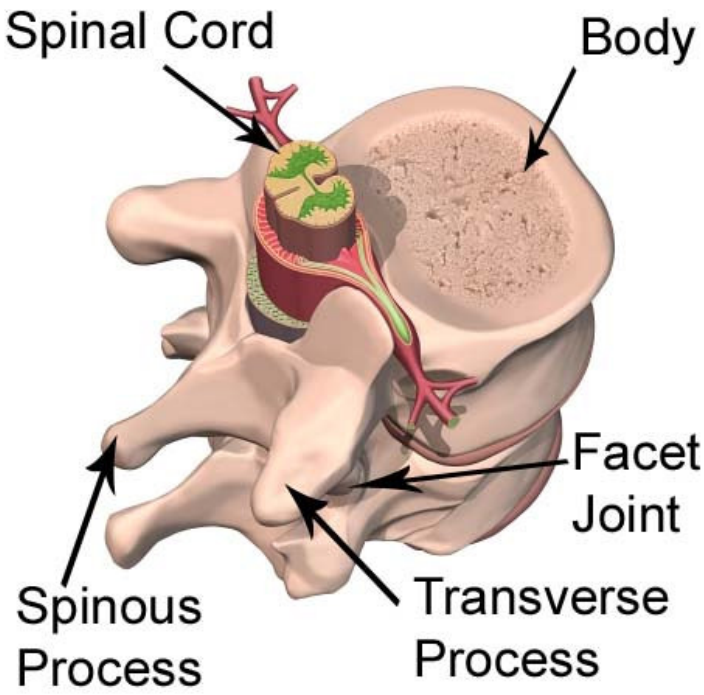
Fibrous (synarthrodial): This type of joint is held together by only a ligament. Examples are where the teeth are held to their bony sockets and at both the radioulnar and tibiofibular joints.



Cartilagenous

Cartilagenous (synchondroses and sympheses): These joints occur where the connection between the articulating bones

is made up of cartilage for example between vertebrae in the spine.



A cartilagenous joint between two vertebrae

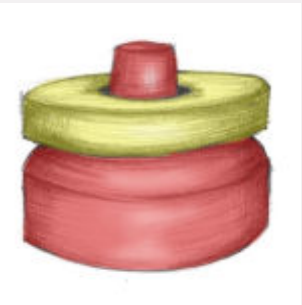
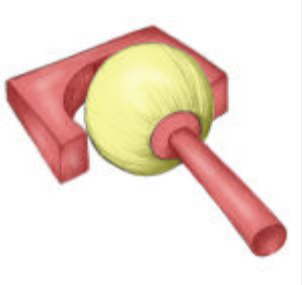
Synchondroses are temporary joints which are only present in children, up until the end of puberty. For example the epiphyseal plates in long bones. Symphesis joints are permanant cartilagenous joints, for example the pubic symphesis.

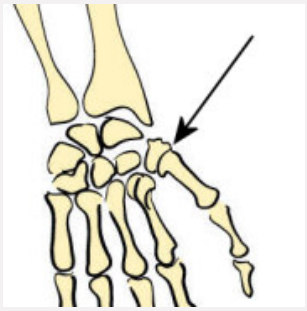
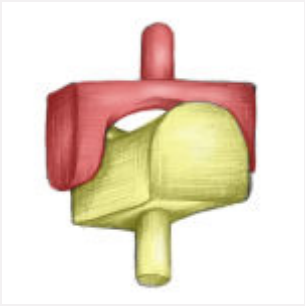
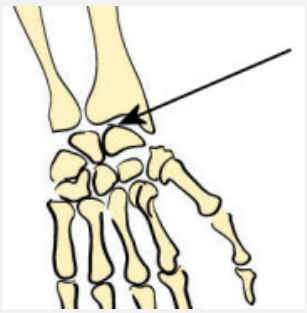
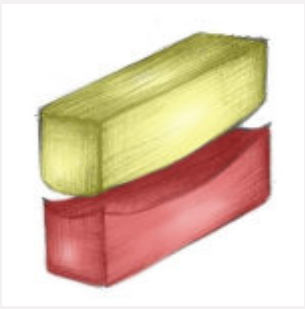
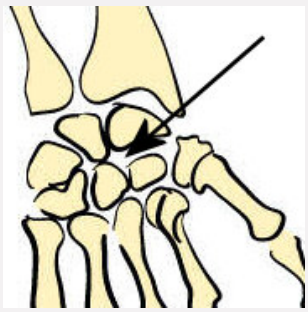
<u>Synovial Joints</u>

Synovial (diarthrosis): Synovial joints are by far the most common classification of joint within the human body. They are highly moveable and all have a synovial capsule (collagenous structure) surrounding the entire joint, a

synovial membrane (the inner layer of the capsule) which secretes synovial fluid (a lubricating liquid) and cartilage known as hyaline cartilage which pads the ends of the articulating bones. There are 6 types of synovial joints which are classified by the shape of the joint and the movement available.

Types of Synovial Joint

Joint Type	Movement at joint	Examples	Structure
Hinge	Flexion/Extension	 **Elbow/Knee**	 **Hinge joint**
Pivot	Rotation of one bone around another	 **Top of the neck** (atlas and axis bones)	 **Pivot Joint**
Ball and Socket	Flexion/Extension/Adduction/ Abduction/Internal & External Rotation		

		Shoulder/Hip	Ball and socket joint
Saddle	Flexion/Extension/Adduction/ Abduction/Circumduction	 **CMC joint of the thumb**	 **Saddle joint**
Condyloid	Flexion/Extension/Adduction/ Abduction/Circumduction	 **Wrist/MCP & MTP joints**	 **Condyloid joint**
Gliding	Gliding movements	 **Intercarpal joints**	 **Gliding joint**