

Module 1

07. Control and Coordination



What happens when we see tasty food?



Saliva comes out from our mouth

How do we feel when someone hurts us?



We feel sad or we cry

What we do when we feel cold?



We shiver

Regulating

What is

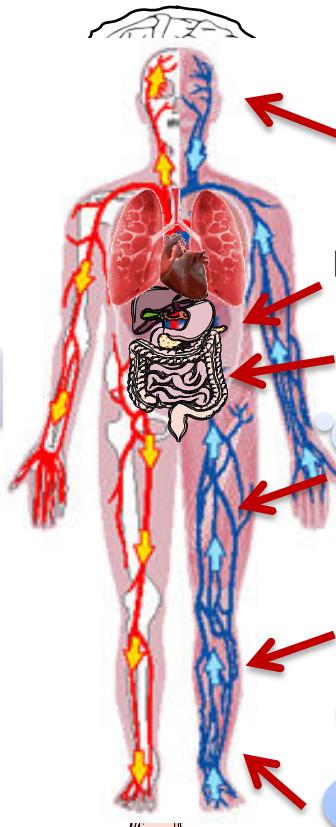
There is something inside our body which is controlling our body and our emotions.

our body?



This is what we will study in the chapter

07. Control and Coordination



Organism

fe Consists of

Brain

Lungs

Group

Heart cell

Cell

Stomach

organ
+ orga

Intestine

Group of tissues
together form
organs

Now, let us see
few organs of
our body

All organ
systems working
together forms
system

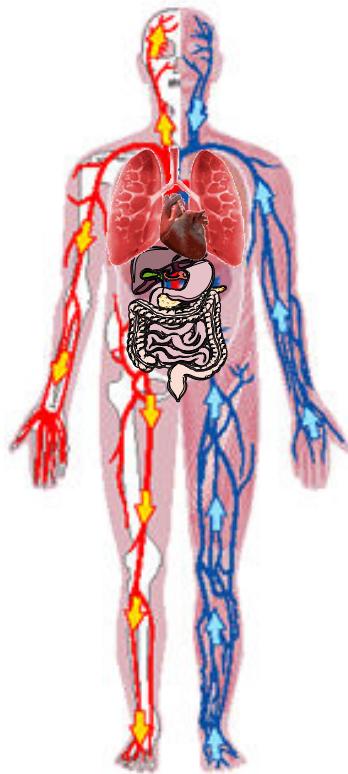
Are made up of

that are living

things

Cells

It is the basic
structural and
functional unit of life



Organism

Let us understand with
an example



But how does this
organism function ?



Thank You

Module 2

This is called as co-ordination. When the eyes send the message to the brain. The brain sends message to the heart to beat fast and the legs to start running.



Stimulus is any change in the external environment

Stimulus

Step by step

Implementation

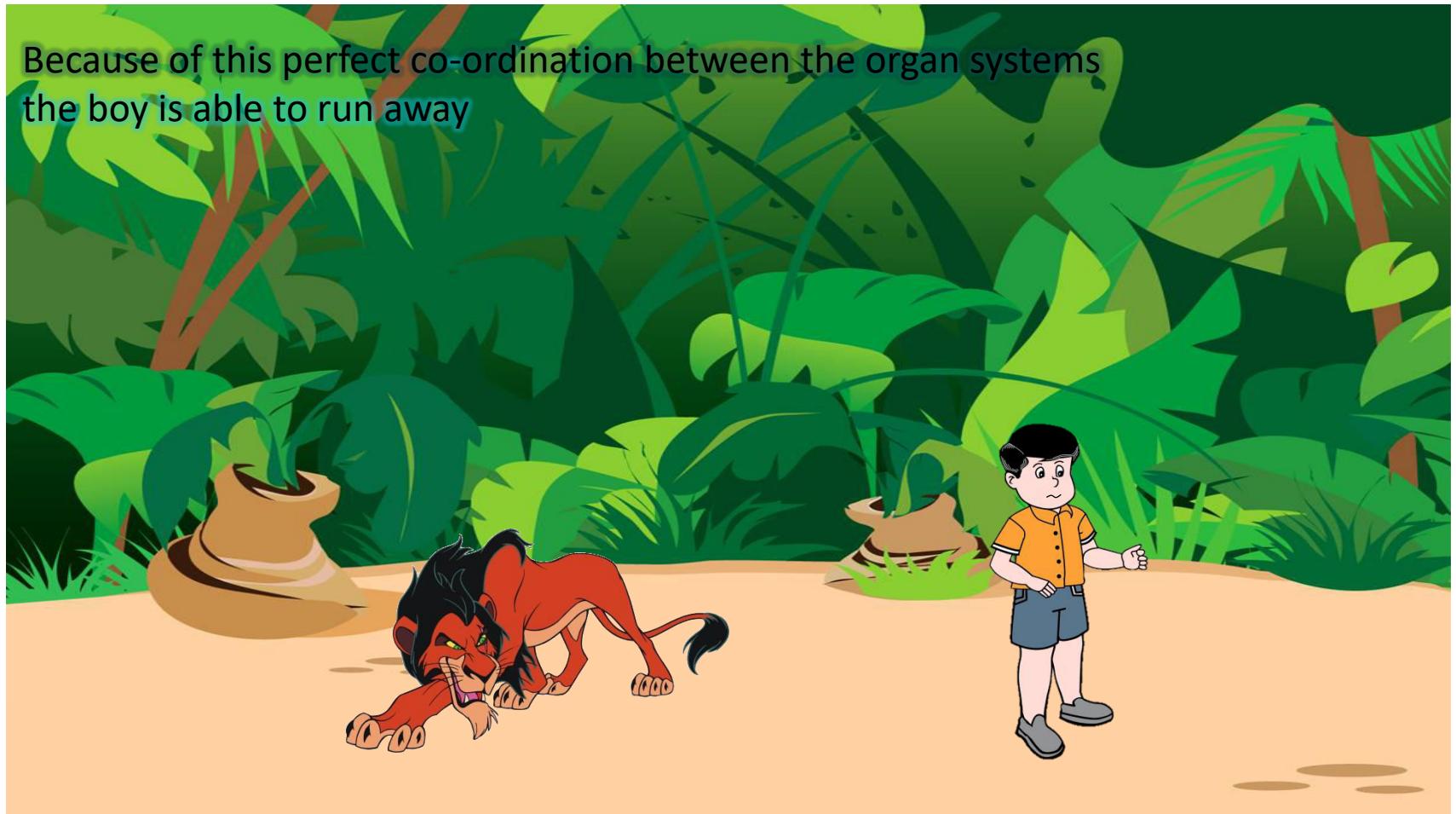
Co-ordination means orderly execution of all activities.

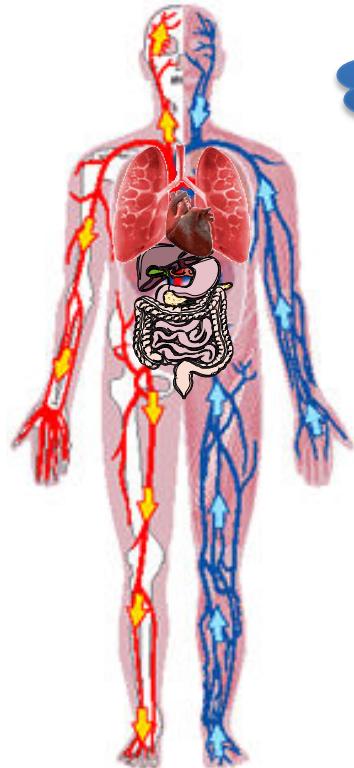


Because of this perfect co-ordination between the organ systems
the boy is able to run away



Because of this perfect co-ordination between the organ systems
the boy is able to run away





Perfect

So now we know

For perfect functioning of an organism there
No be perfect co-ordination among different
systems or organs and various stimuli from their

But do we show the same
response to every stimulus ?

Organism



Thank You

Module 3



STIMULUS

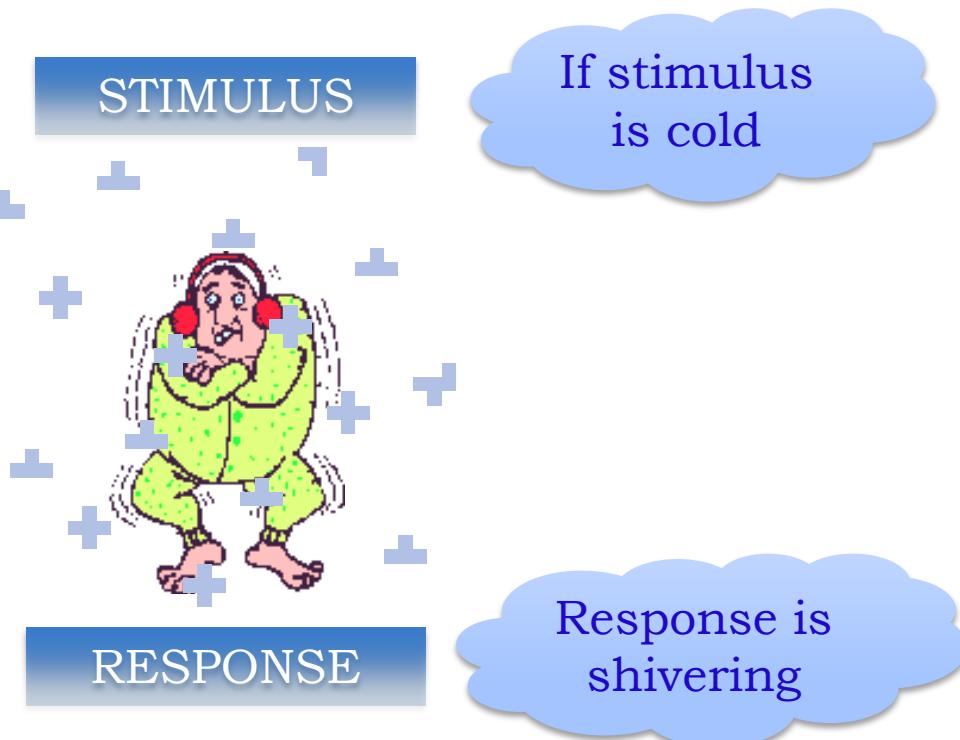
If stimulus
is heat



RESPONSE

Response
is sweating

~~Stimulus is any stimulus that triggers different responses~~



Control

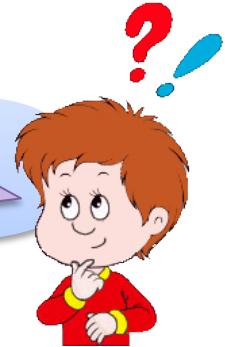
Control & coordination are required for proper functioning of an organism.

Control refers to the systematic regulation of various activities



Coordination

Why is control and co-ordination required ?



Let us see some examples of control and co-ordination in plants and animals

Thank You

Module 4

Animals can move from one place to another and this motion is called as Locomotion

move ?

NO

Can animals move ?

YES



But how do plants move ?

nervous system and muscular system



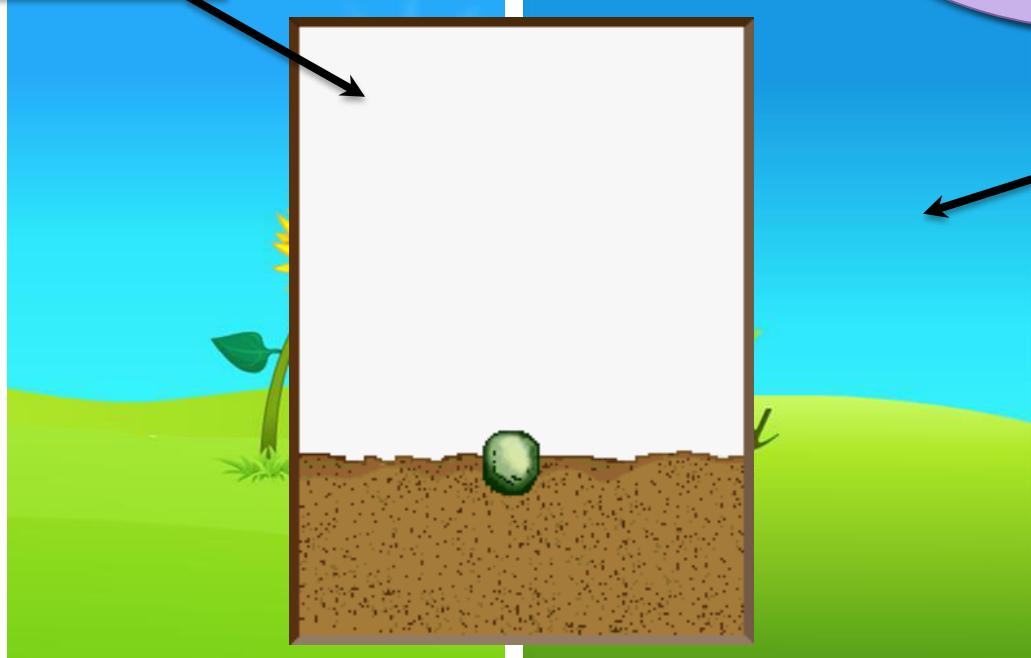
Let us study movements in plants

Plants move in response to external stimuli

Stimulus
is Light

No !!!

HORMONES



Do plants have
muscular system
and nervous
system ?



Growth

Due to
Body
Is the

If growth is
prevented there
will be no
Movement

Such movements are called as
Growth dependent



Plant

Two types of movement
are controlled by

Growth independent

Movement is
not dependent
on growth

Such movements are called as
Growth independent

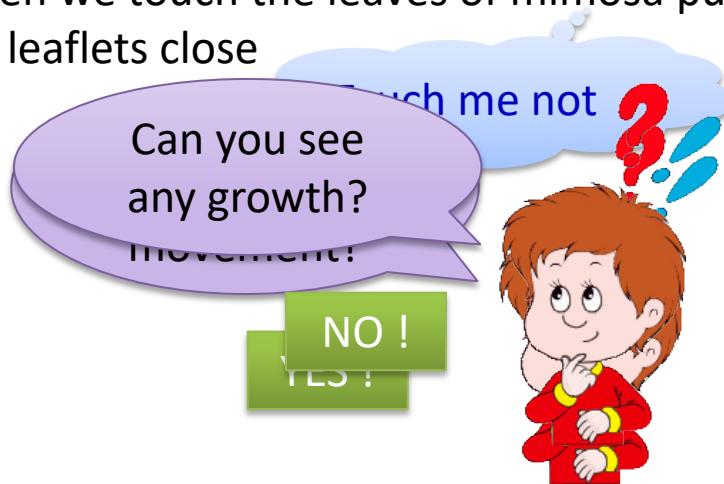


Thank You

Module 5

Growth independent :

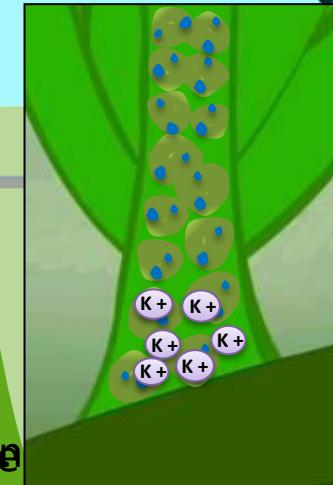
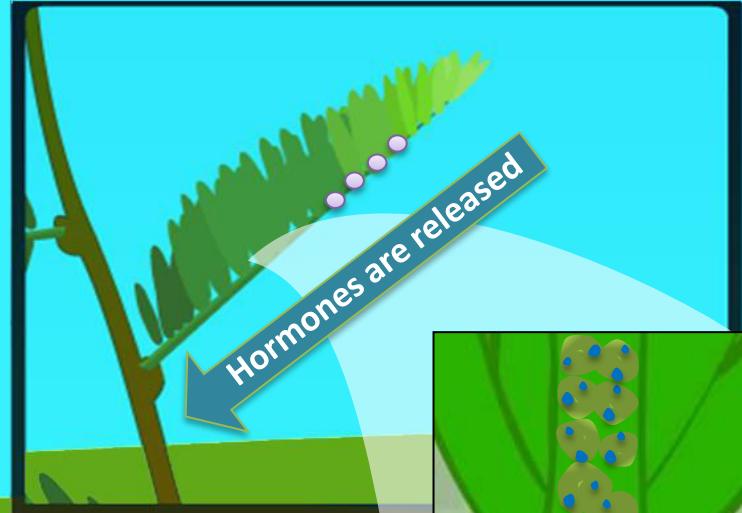
- Certain movements of plants that do not result in their growth are termed as growth independent movement.
- When we touch the leaves of mimosia pudica plant the leaflets close



- So this is a perfect example of growth independent movement.
- In this, the movement is in response to the stimulus of touch.
- This movement is called as "**SEISMOSNASTIC MOVEMENT**".

Growth independent :

Let us see how does this happen.....



The plant bends towards the light because it depends on the information another part gives the information for surrounding.

So what does it mean about growth independent movement ?

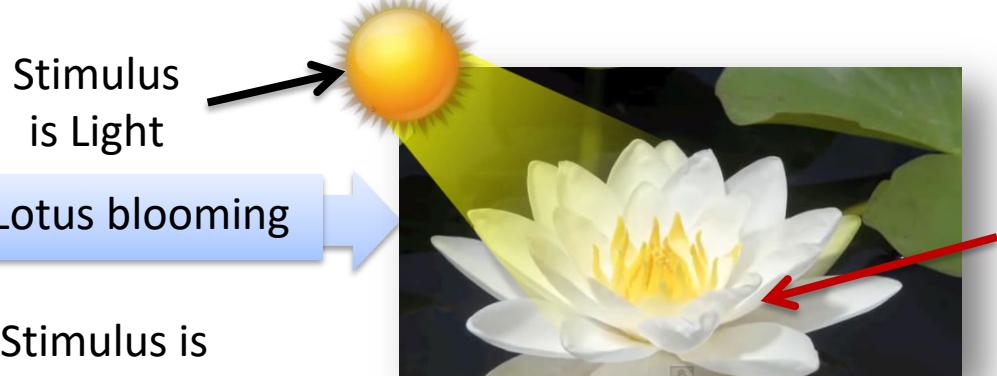
- Ions – Charge elements Hormones differ from the place of touch.
- This means that the information has been communicated.
- The plant use electrical and chemical means to transfer the information from one cell to another.
- There is no specialized tissue present for conduction of information.
- The cells either swell or shrink and thus change their shape to cause movement in plant.



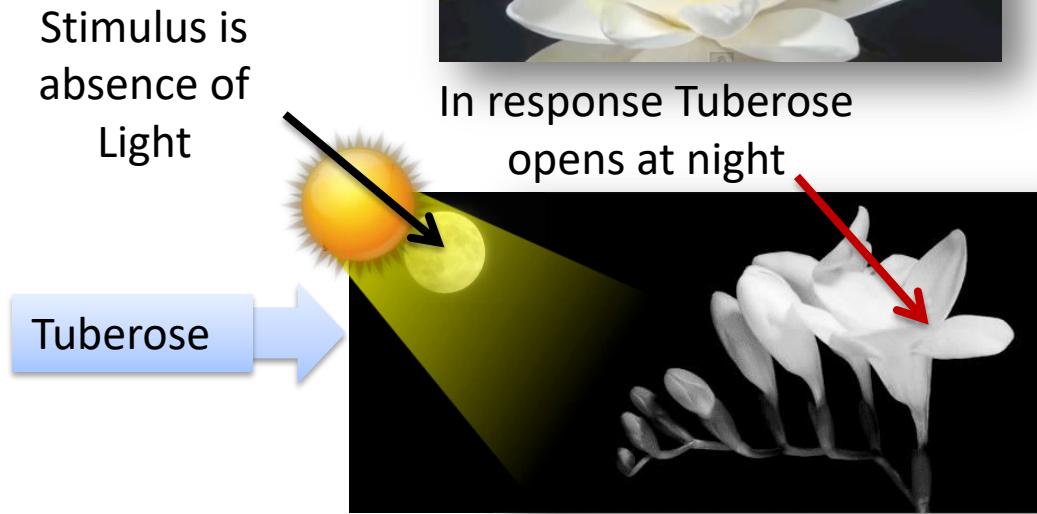
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Module 6

■ Some examples of growth independent movements

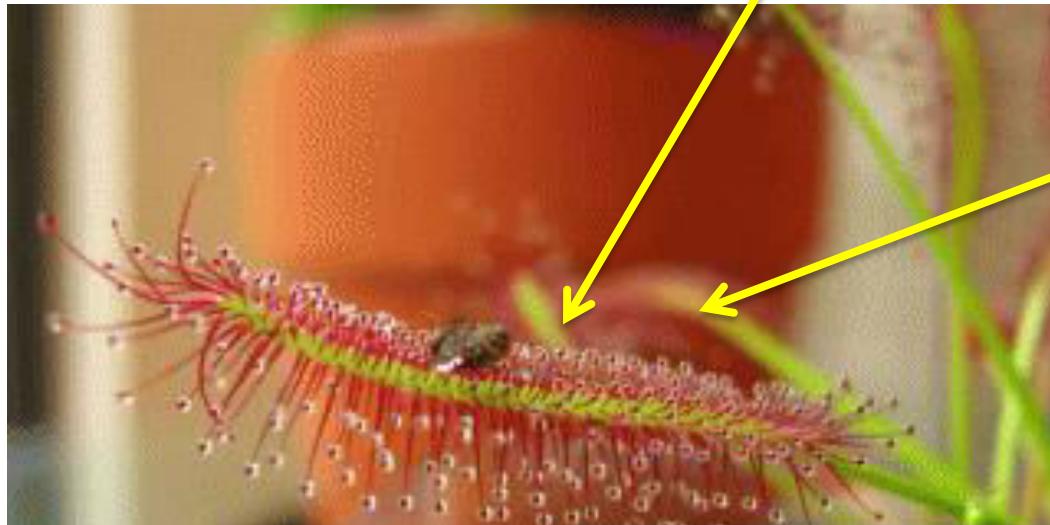


In response lotus
opens in the morning



In response Tuberose
opens at night

Drosera



Stimulus is touch
of an insect

Insect eating

In response insectivorous
plants like Drosera curl
inwards to trap the insect

Venus flytrap

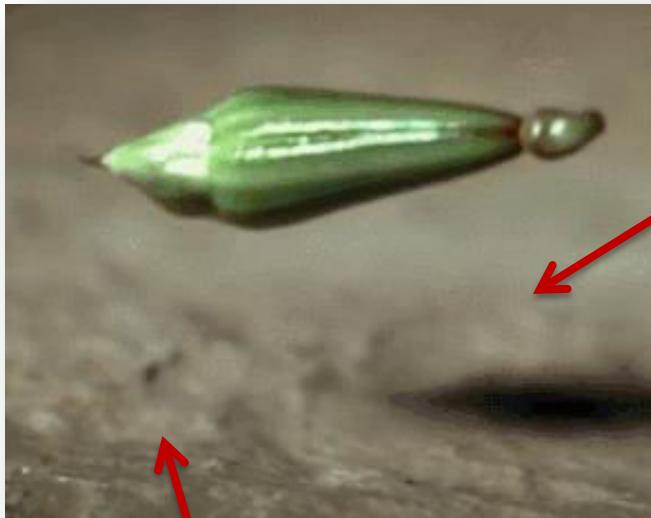
Venus flytrap looks and smells like a flower to the insects



Stimulus is touch
of an insect to
the trigger hair

In response Venus flytrap
shuts and digests the insect

Fruit of balsam



In response explosive fruit of balsam plant bursts open at appropriate time to scatter the seeds

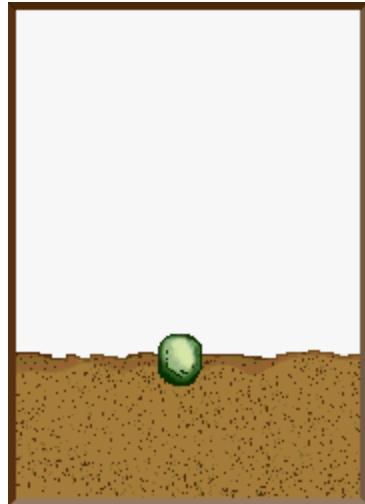
Stimulus is touch

Thank You

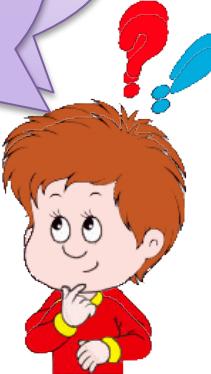
Module 7

Let us study growth dependent movements :

- Movement or growth of any part of plant in response to an external stimulus is called **Growth dependent movement** or **Tropism**
- Movement in a seedling is always growth dependent



Who shows
growth
dependent
movement ?



Movement or growth of any part of plant in response to an external stimulus is called **Growth dependent movement** or **Tropism**

Plant show Four types tropism

- ■ Phototropism
- ■ Chemotropism
- ■ Gravitropism
- ■ Hydrotropism

Photo means light.

So movement towards light.

Chemical.

So movement towards chemicals.

movement

towards gravity.

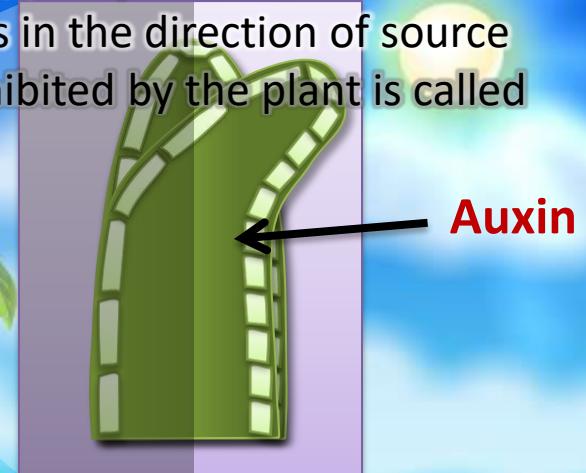
water. So

movement towards water.

Phototropism :

At the tip of the stem there is a hormone called as Auxin. Auxin causes the cells of the stem to elongate. This causes difference in length of both the sides. The auxin from one side makes the stem longer than the other side. This causes the stem to bend towards the sunlight.

Let us magnify the upper end of the stem towards the stimulus of light i.e. it grows in the direction of source of light.



Shady side

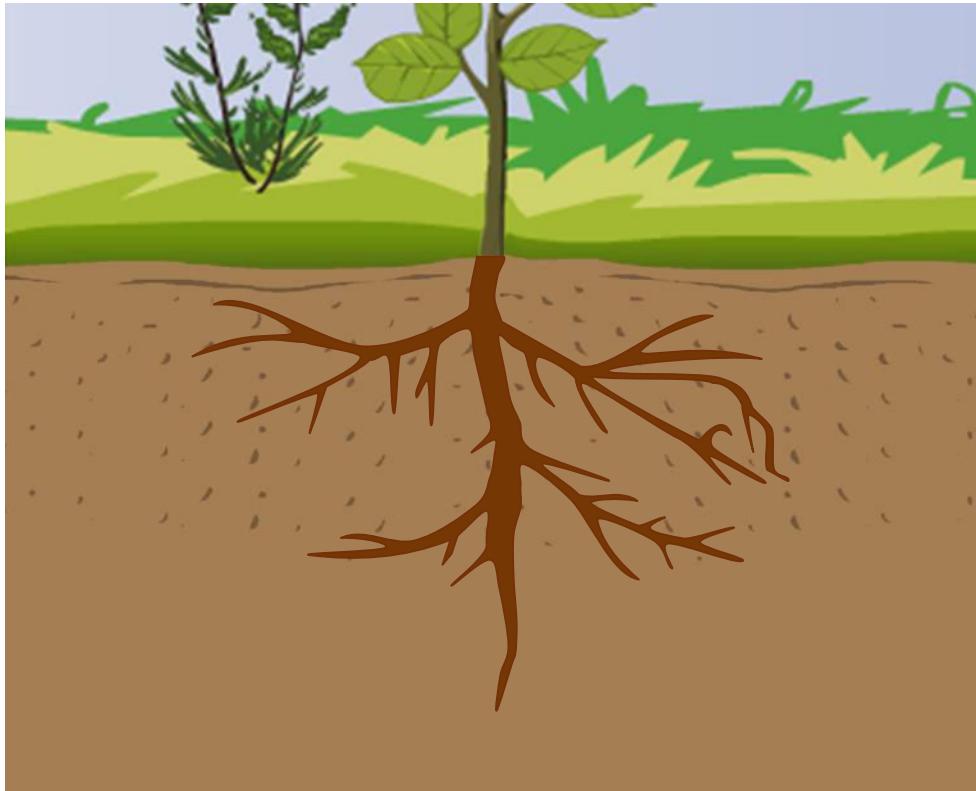
Sunny side

Thank You

Module 8

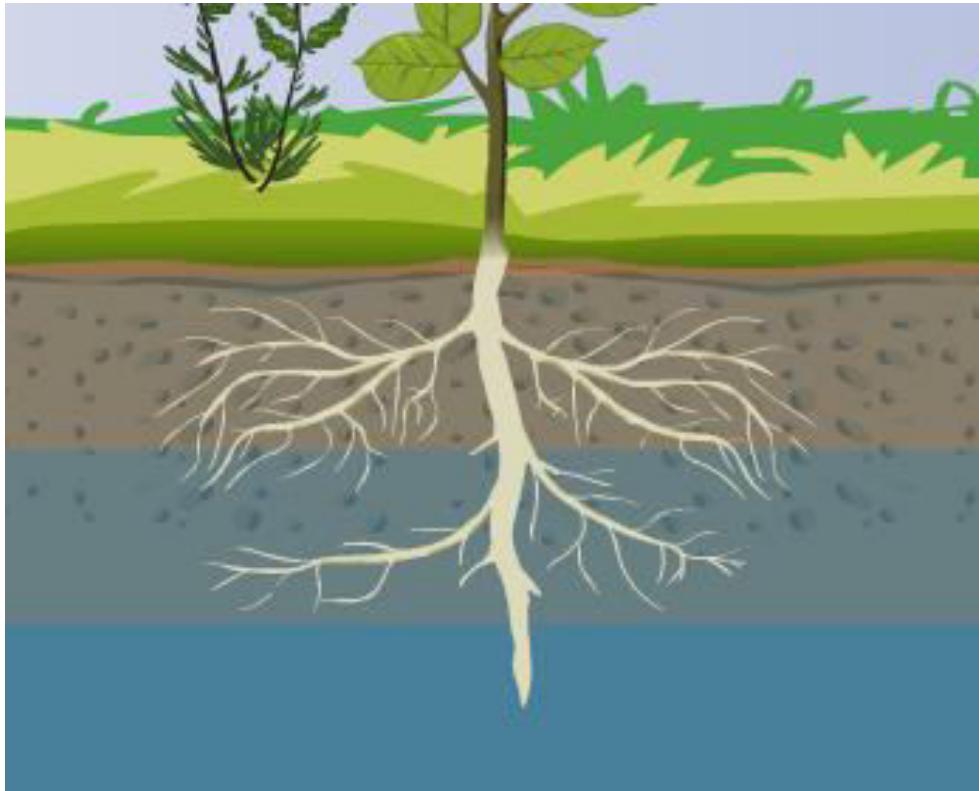
Gravitropism :

Root system of plant responds to stimulus of gravity



Hydrotropism :

Root system of plant responds to stimulus of water



Chemotropism :

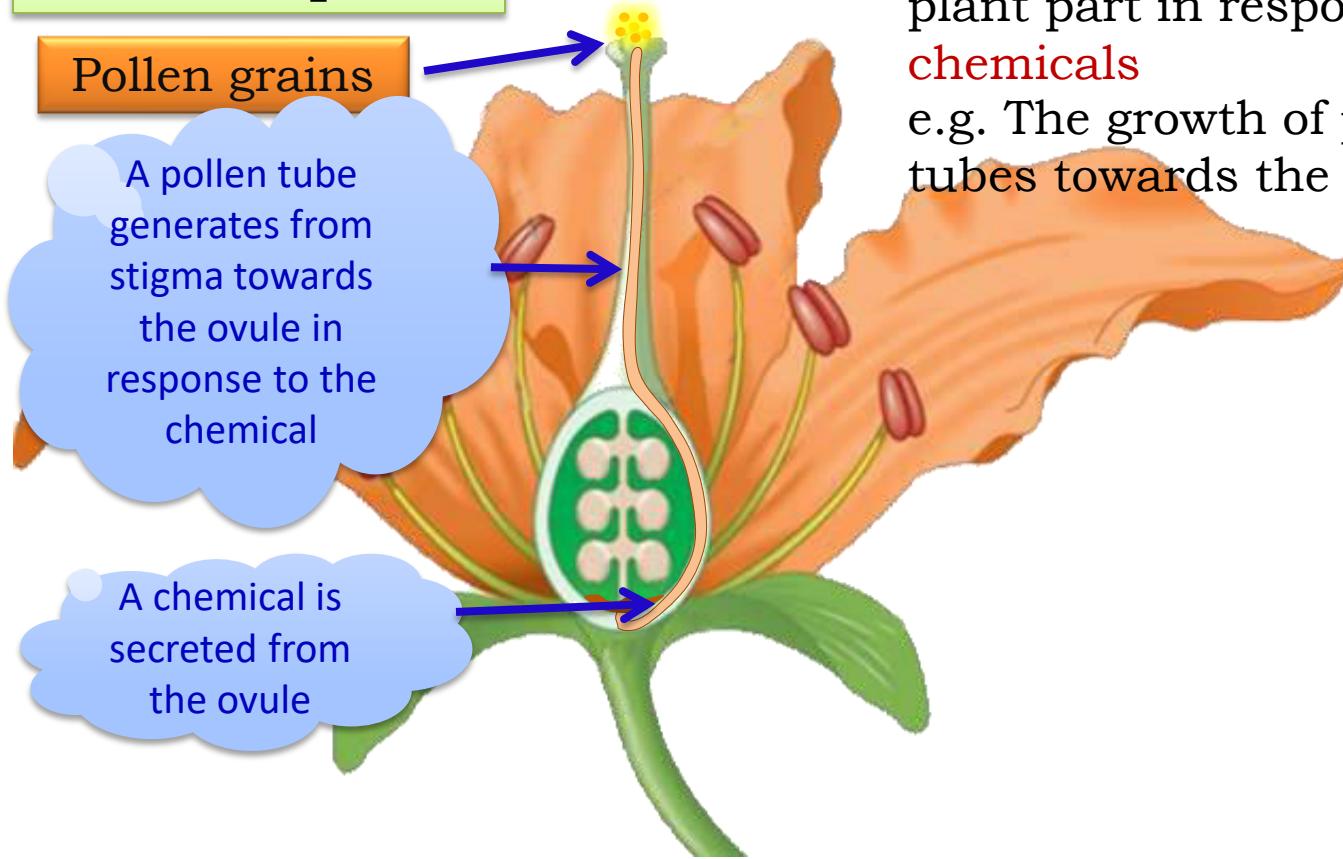
Pollen grains

A pollen tube generates from stigma towards the ovule in response to the chemical

A chemical is secreted from the ovule

It is the movement of plant part in response to **certain chemicals**

e.g. The growth of pollen tubes towards the ovules



Thank You

Module 9

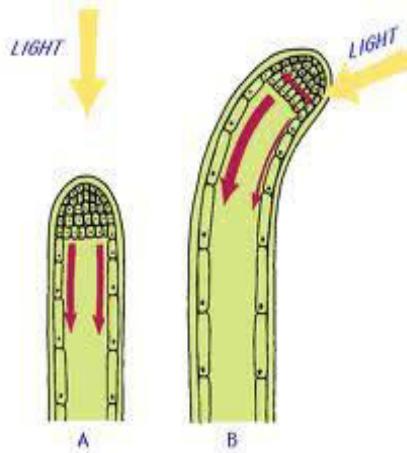
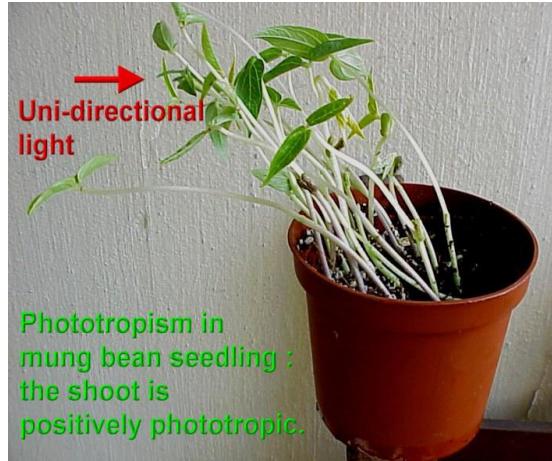
Plant movements are coordinated by **HORMONES**

There are Four type of plant hormones

1. Auxin
2. Gibberelins
3. Cytokinins
4. Abscisic Acid

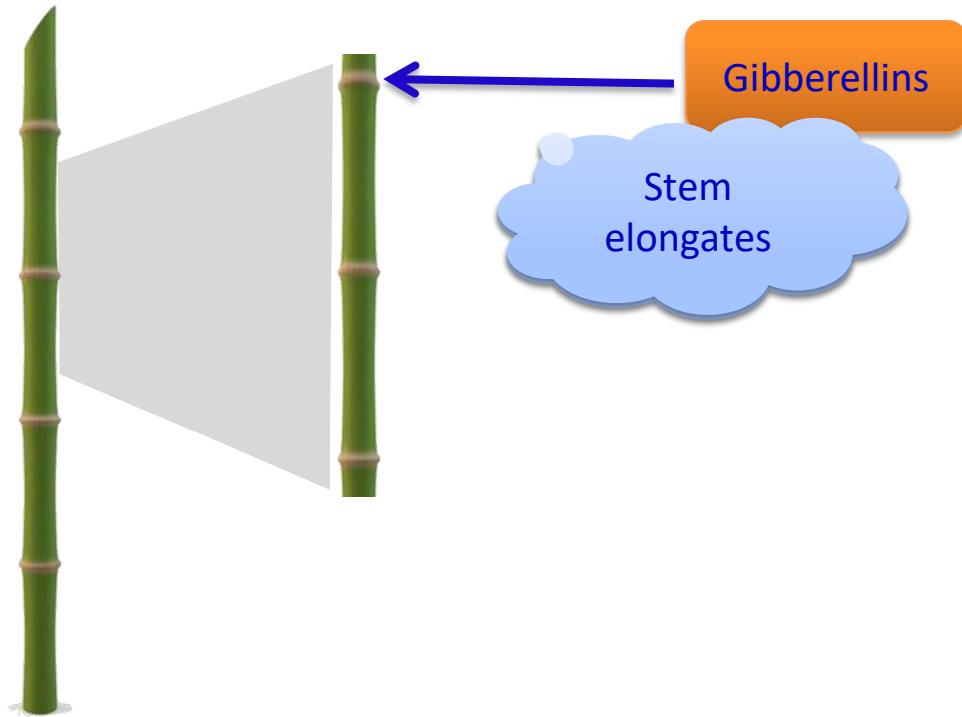


Auxin : Help shoot cells to grow longer



GIBBERELLINS

helps in growth of the stem



CYTOKININS : Promote cell division.



ABSCISSIC ACID : Inhibits growth and leads to wilting of leaves



Can you recollect the roles of all the plant hor

AUXIN : Help shoot cells to grow longer

GIBBERELLINS : Help in growth of the stem

CYTOKININS : Promote cell division

ABSCISSIC ACID : Inhibits growth
and leads to wilting of leaves



Growth
Inhibitor

Are all the
hormones
promoting
growth?

Stops the
growth



Thank You

Module 10

Let us see some other examples



Pea plant showing
tendril



Grape vine plant
showing tendril

Why does the tendril entwine around the object ??

- Tendrils are sensitive to touch.
- When they come in contact with any object,
- The portion of the tendril which is in contact becomes sluggish where as growth is faster at the other portion.
- This causes the tendril to entwine itself around the object and thus cling to it.



Thank You

Module 11

Co-ordination in human beings is controlled by two mechanisms

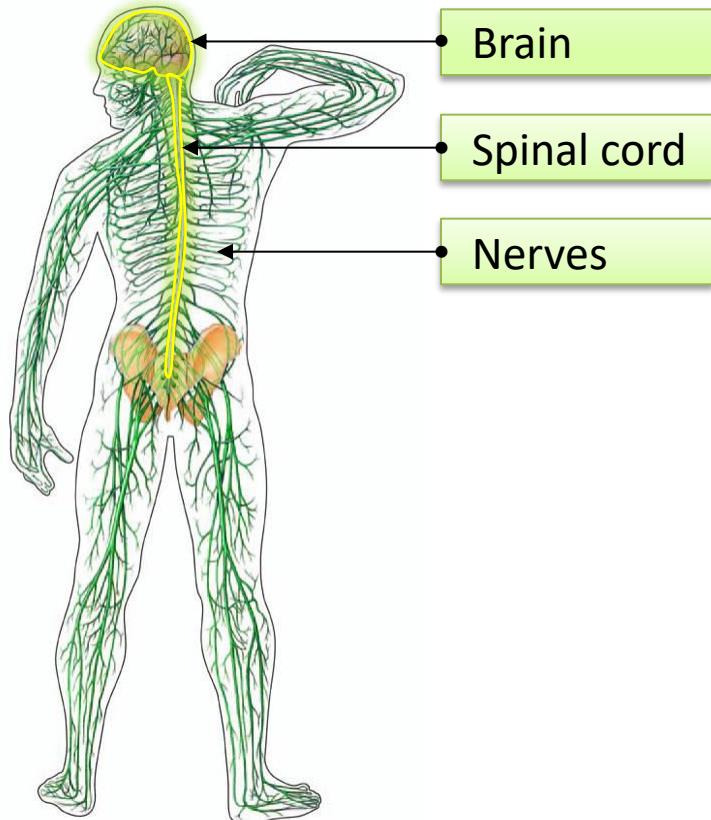
Nervous control

Chemical control

Let us first see
what is Nervous
control ?



Human nervous system consists of



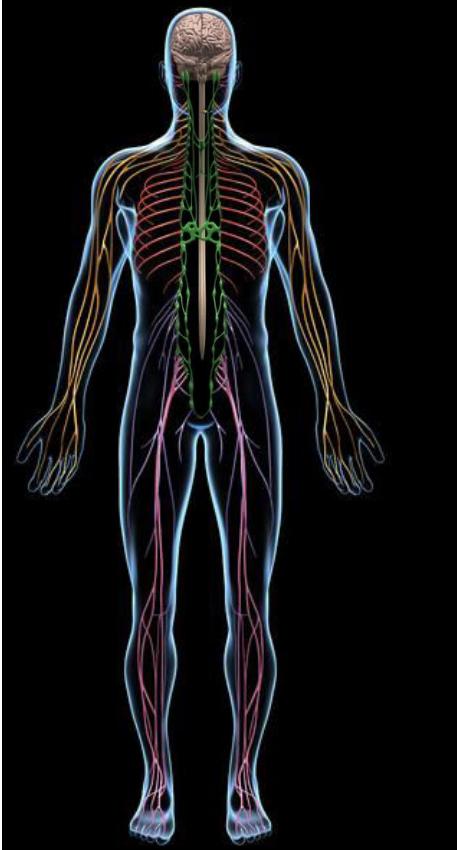
NERVOUS SYSTEM

Nervous system is a system that controls all of the activities of the body.

The nervous system can be divided into three parts :

1. Central nervous system (CNS)
2. Peripheral nervous system (PNS)
3. Autonomic nervous system (ANS)

Central nervous system consists of

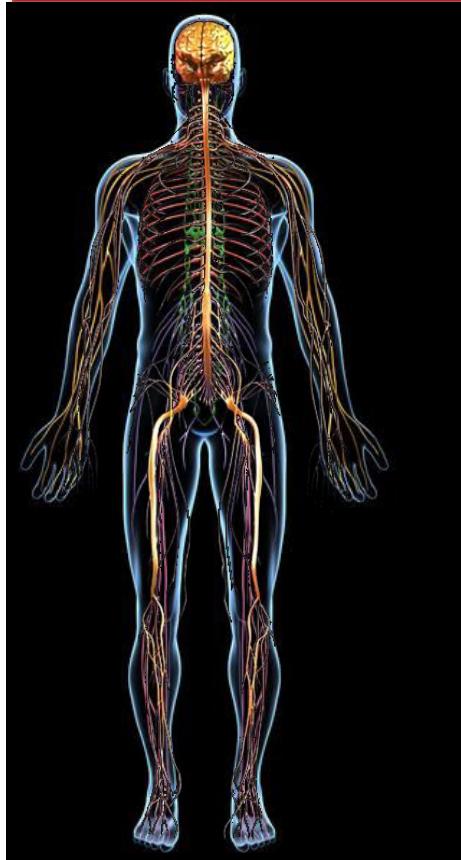


Brain and
spinal cord

It regulates all activities of
body.

Control

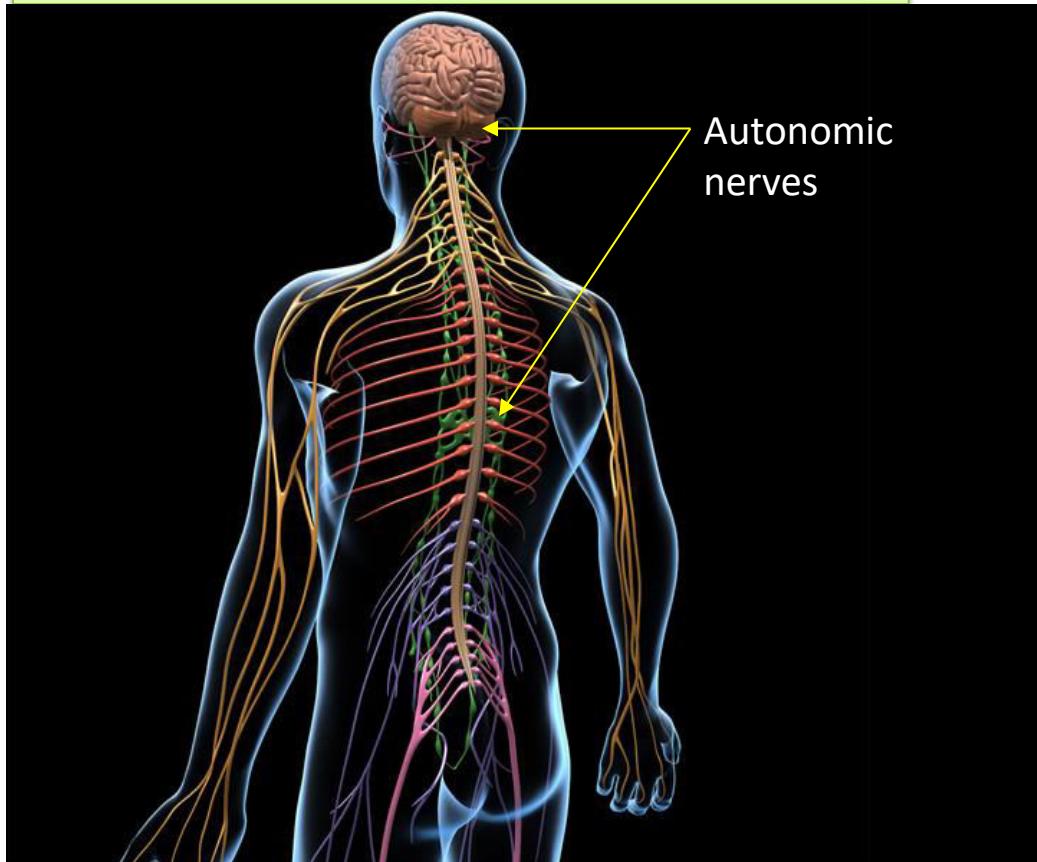
Peripheral Nervous system consists of



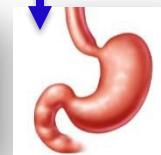
All the nerves present in the periphery of the body

It is a network of nerves spread through out the body connecting all parts of the body to the central nervous system.

Autonomic nervous system consists of



Nerves which are present in the involuntary organs like heart, stomach, lungs etc.



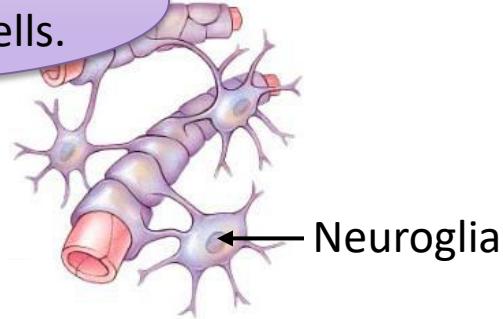
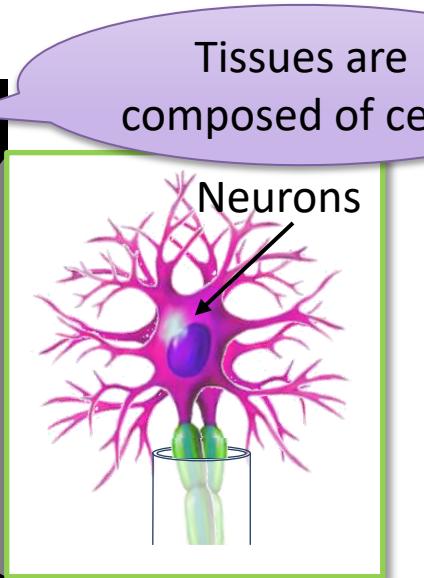
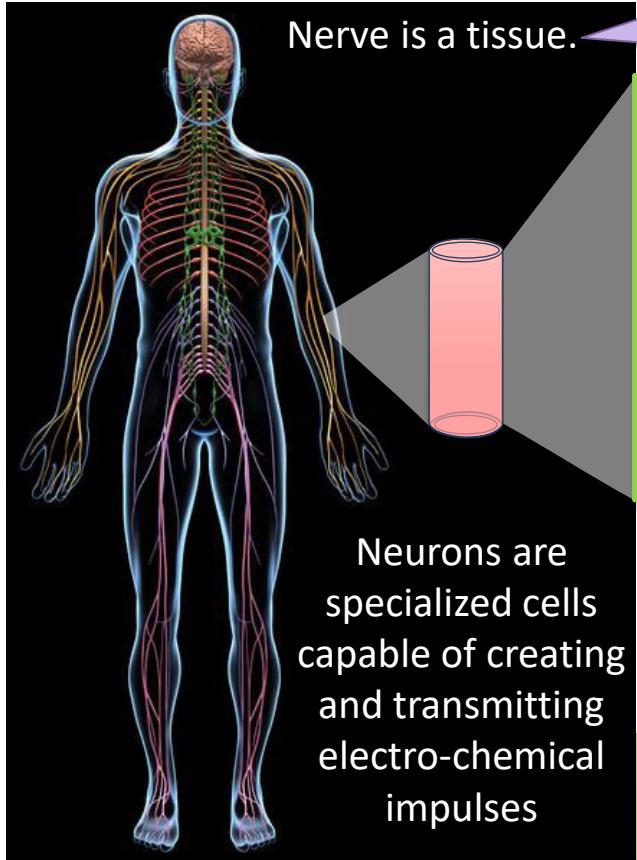
Thank You

Module 12



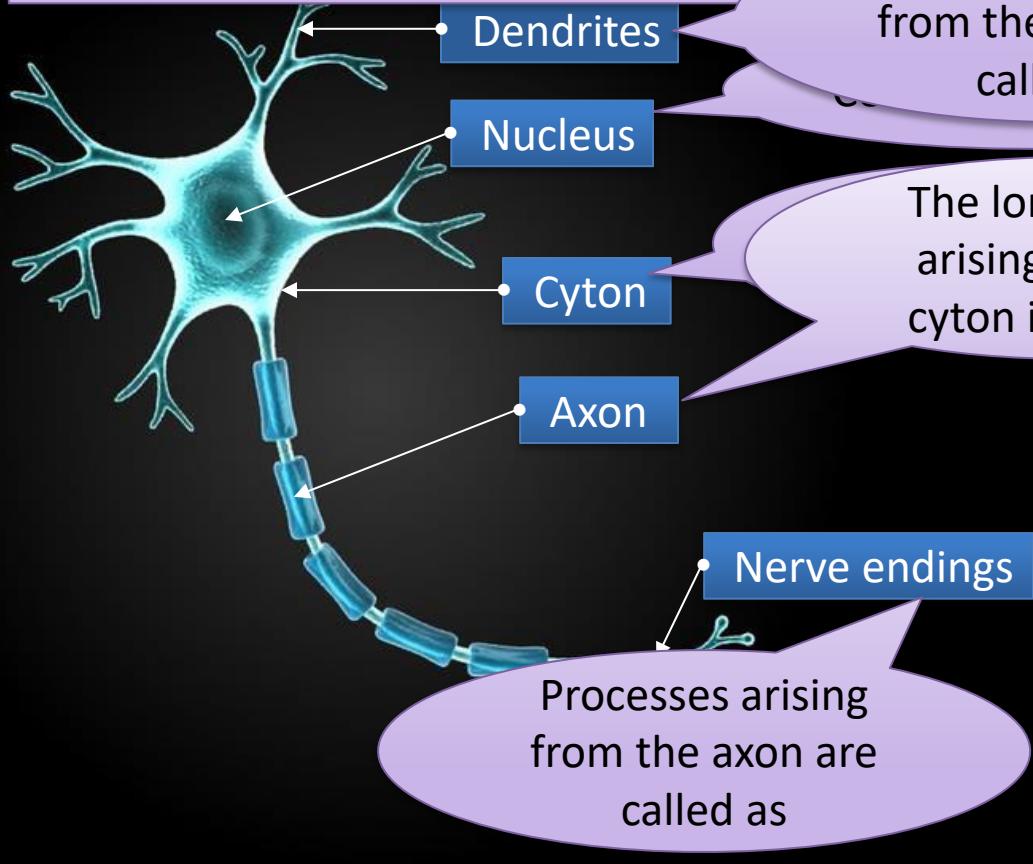
What is a nerve?





Nerve tissue is composed of special cells called as Neurons.
and supportive cells called as Neuroglia.
Neuroglia are supportive cells which assist neurons in their function.

Structure of neuron consists



Branches arising from the cyton are called as

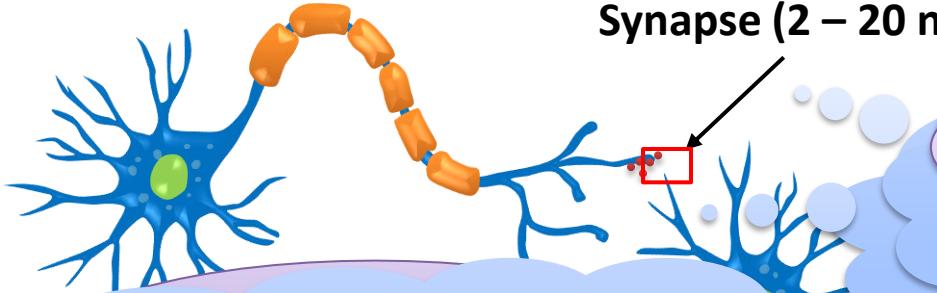
The long process arising from the cyton is called as

Processes arising from the axon are called as

Thank You

Module 13

Synapse (2 – 20 nm)



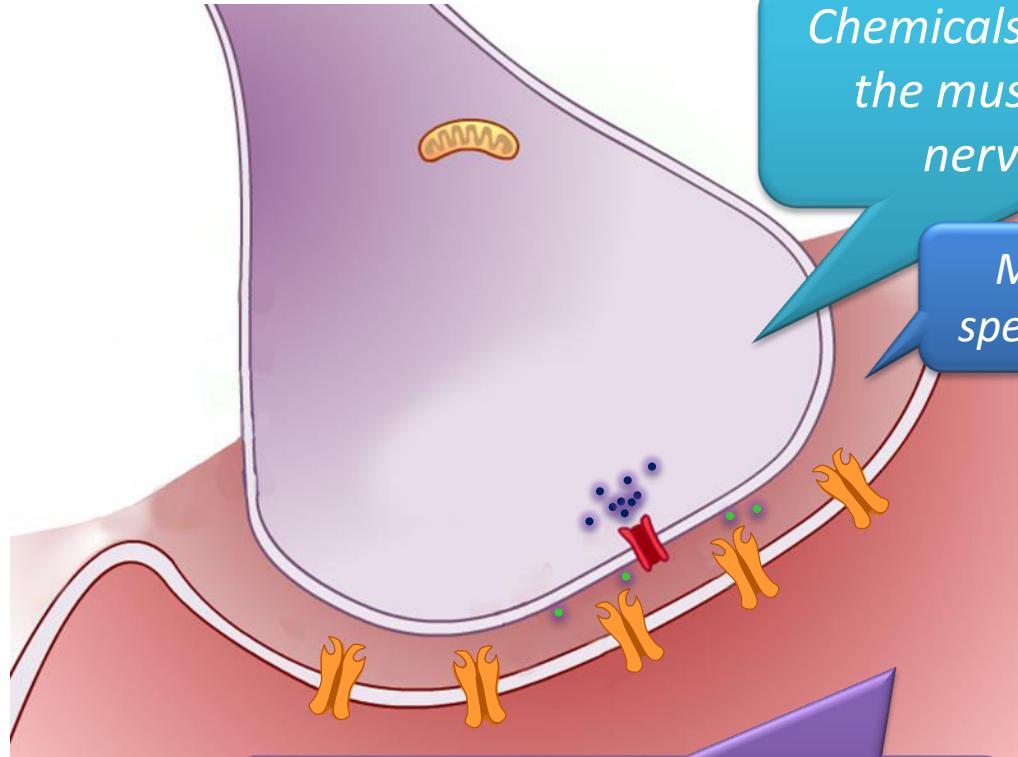
It sets off a chemical reactions producing an electrical impulse which travels from the dendrites to the cell body, through the axon to its end.

What happens in Muscles ?
the axon to the next neuron



and are delivered to the muscle cells or glands.

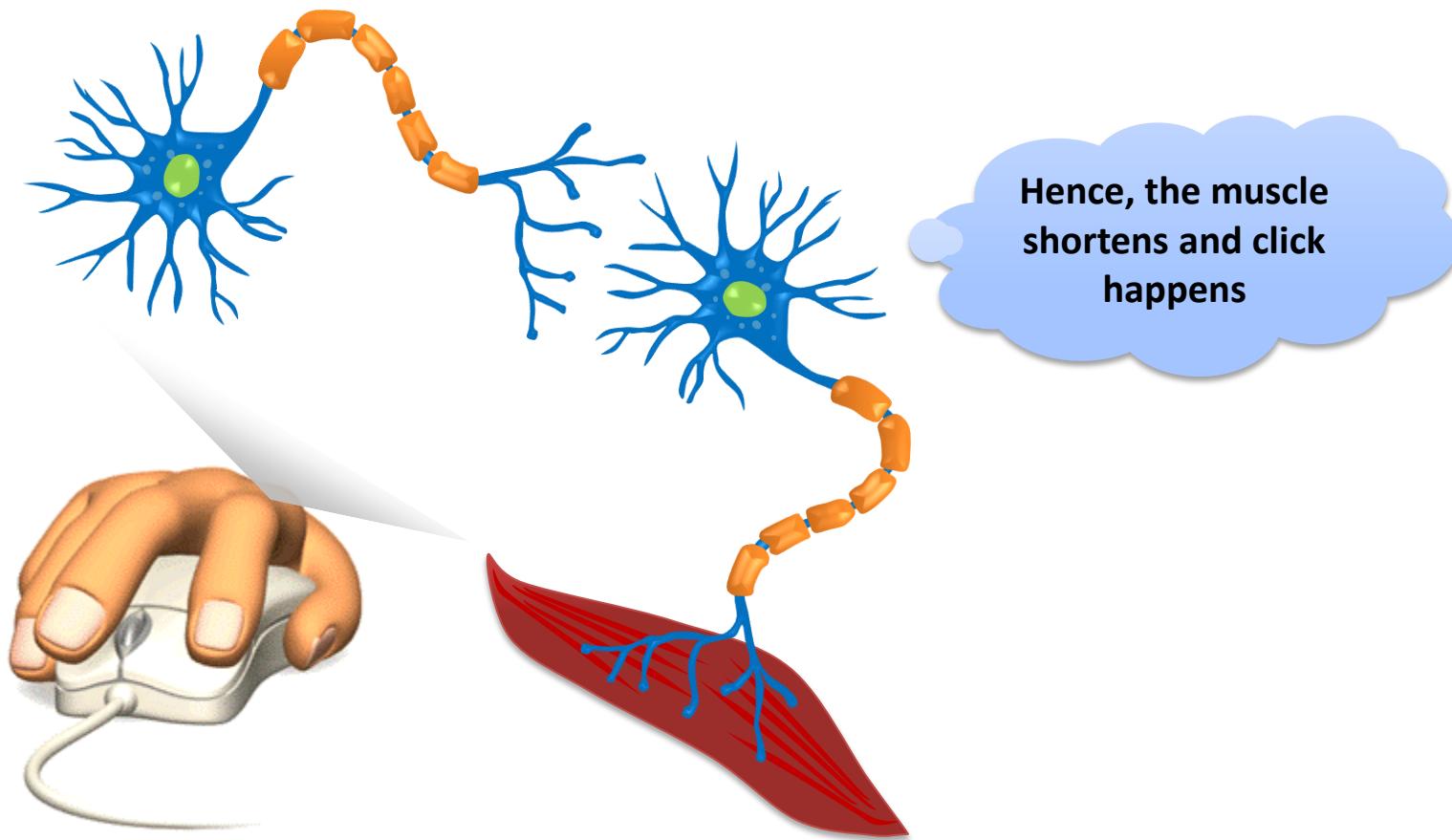
The information from the environment is picked up by the specialized tips of dendrites.



*Chemicals are released in
the muscle cells from
nerve endings.*

*Muscle cells possess
special kinds of proteins*

*They bring change in their shape
and shortens the muscle.*



Hence, the muscle shortens and click happens

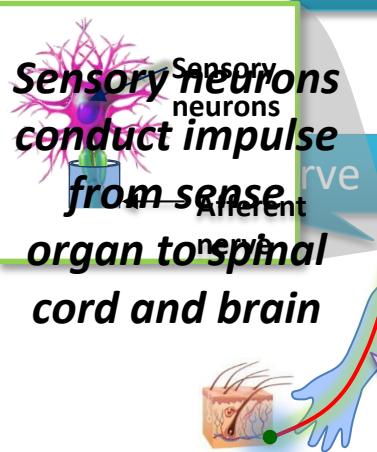
Thank You

Module 14

Now let's study

Types of nerves

Association neurons



Afferent nerve is made up of sensory neurons

The integrative functions of nervous system performed by the interneurons to the effector organs are called as

Motor neurons conduct impulse from spinal cord and brain to

Efferent nerves
Nerves, which carry impulses from the spinal cord to the muscles and glands are called as

Decision making

Let's see all the three neurons working together :

Impulse move from skin to spinal cord and brain through

Afferent nerve

Interneurons

Then brain decides to move the hand with the help of

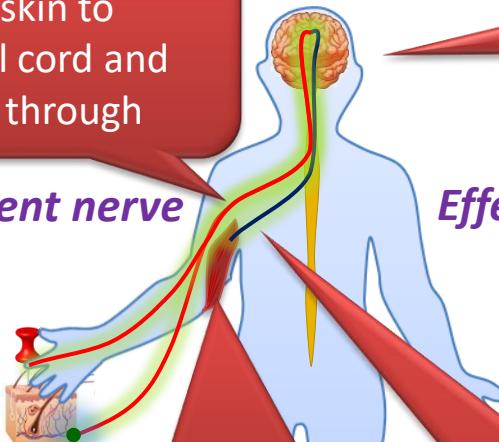
Efferent nerve

and we are able to move the hand.

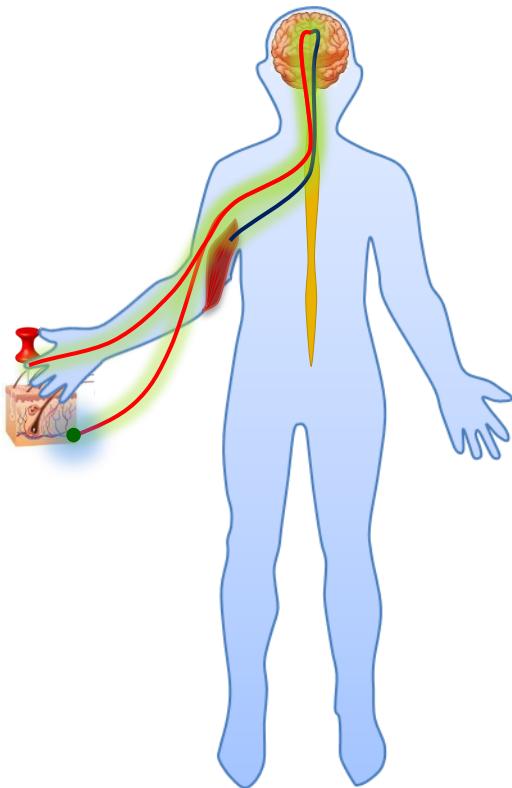
When pin pricks the skin

So the muscle contracts

The impulse moves from brain and spinal cord to the muscle through



Let's see all the three neurons working together :



Thank You

Module 15

What would you do when ?

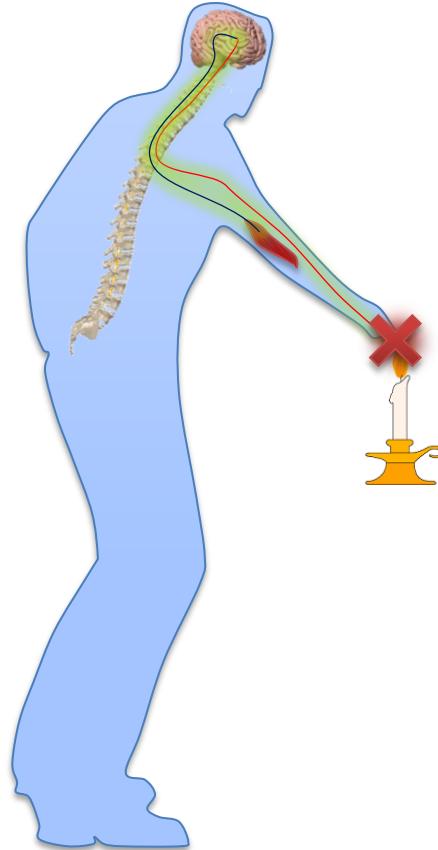
**When you see a motor car coming towards you
or when you see something delicious
or suddenly you hear a loud noise
or if a doctor gives a jerk on the knee.**



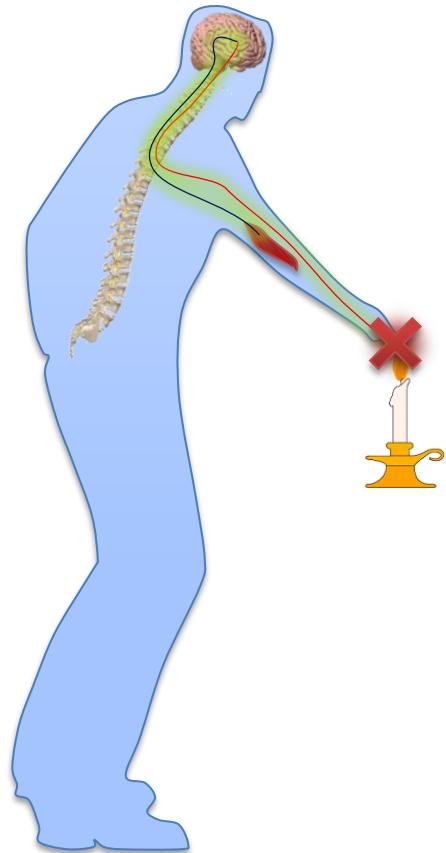
Can we control our reactions during these situations. **NO !**

How can we react in such situations without thinking ?

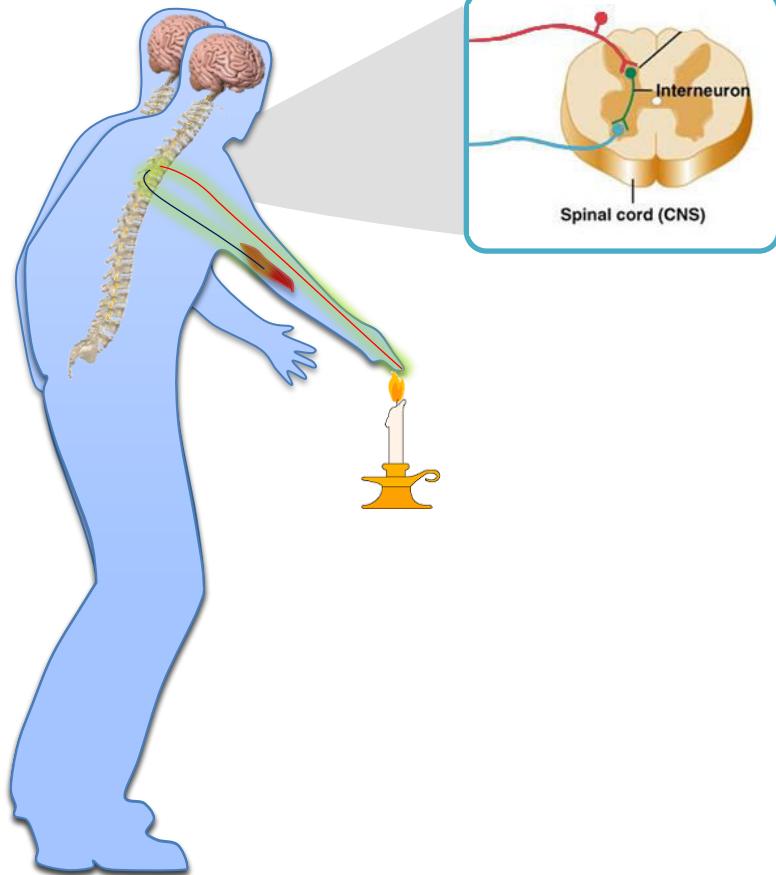




Suppose a boy touches a flame
If he thinks consciously about the flame then
Impulses will generate and travel through
sensory neuron to spinal cord and brain and
comes back through motor neuron to the
effector muscle.
It will take time and he will get wounded.



The other possible way can be



Reflexes spinal reflexes are simple, pre-programmed
reactions to stimuli such as touching a hot surface or being poked.
These reflex arcs take the form of a series of neurons that connect the skin to the spinal cord and back to the muscles.

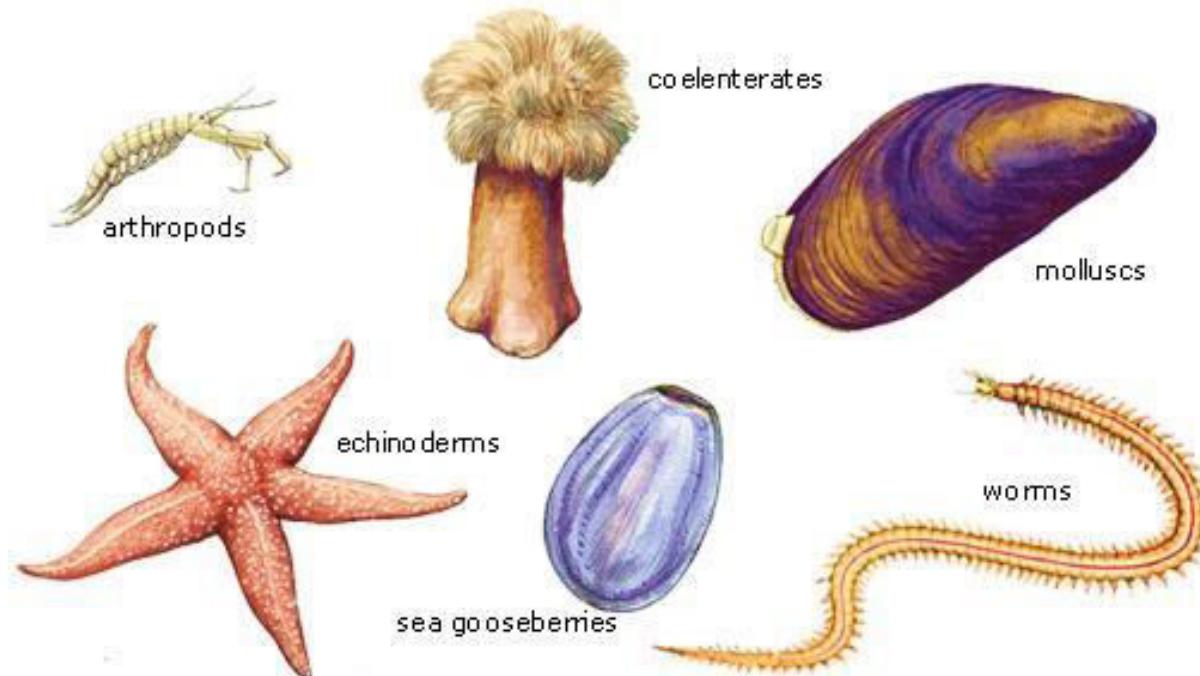
Reflex Action

*Reflex arcs are perhaps evolved in animals because
the thinking process of the brain is a bit slow.*



Reflex Action

In many animals, especially lower animals the complex neuron network needed for thinking is not there or is not well developed.



Reflex Action

Hence the reflex arcs have been evolved as efficient ways of functioning in the absence of the true thought processes.

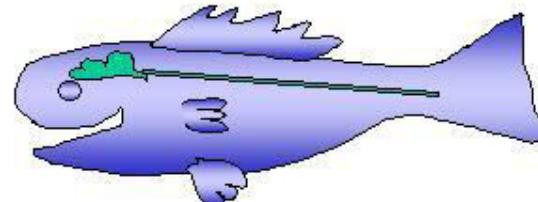
Nerve Cord Evolution



Starfish: A simple network of nerves.



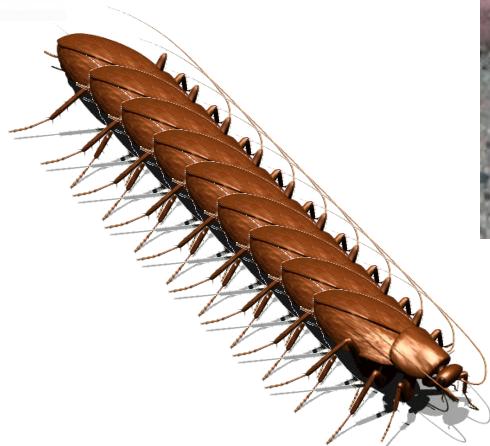
Earthworm: A network of nerves connected to ganglia



Fish: Hollow nerve cord (spinal cord) and a brain

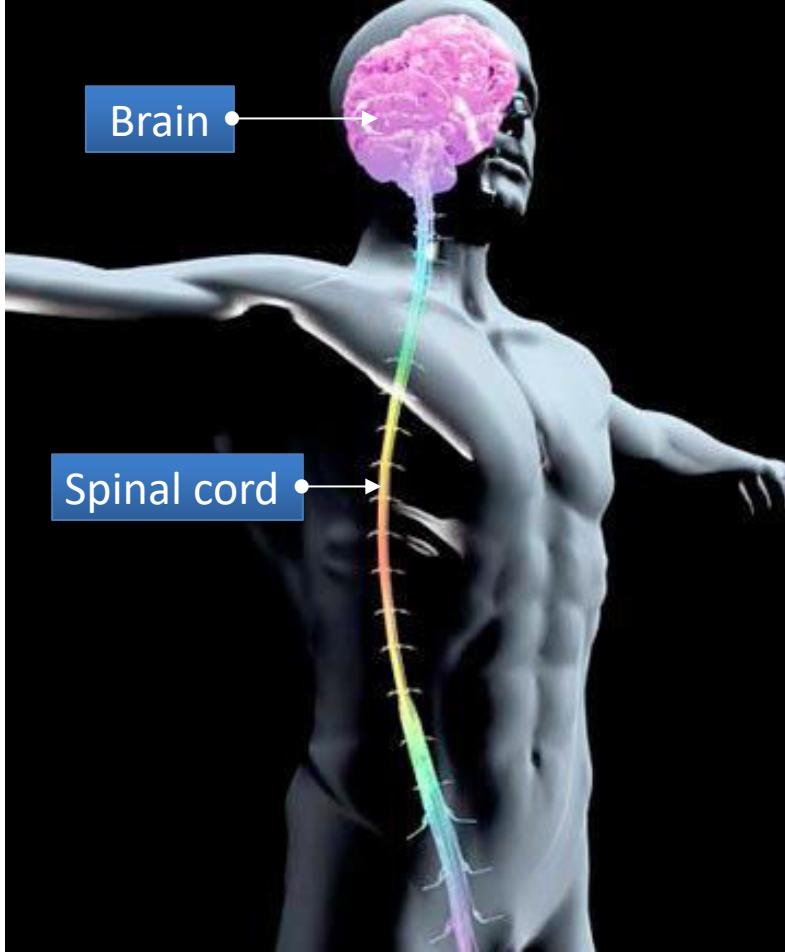
Reflex Action

However, in spite of the presence of complex neuron networks, reflex arcs continue to be more efficient for quick responses.



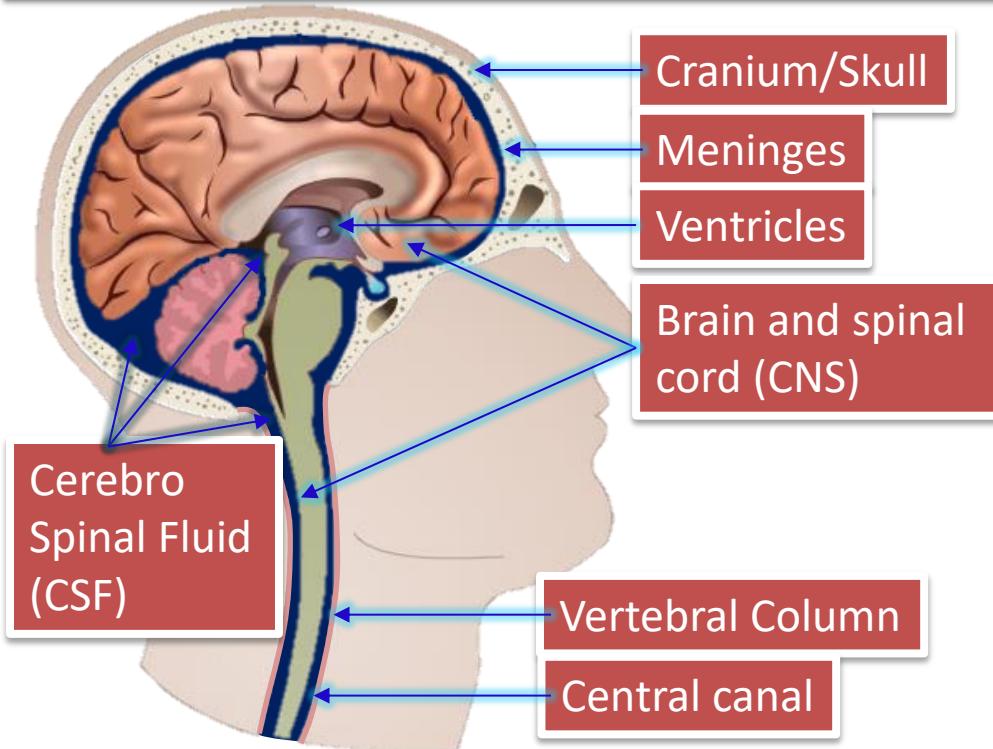
Thank You

Module 16



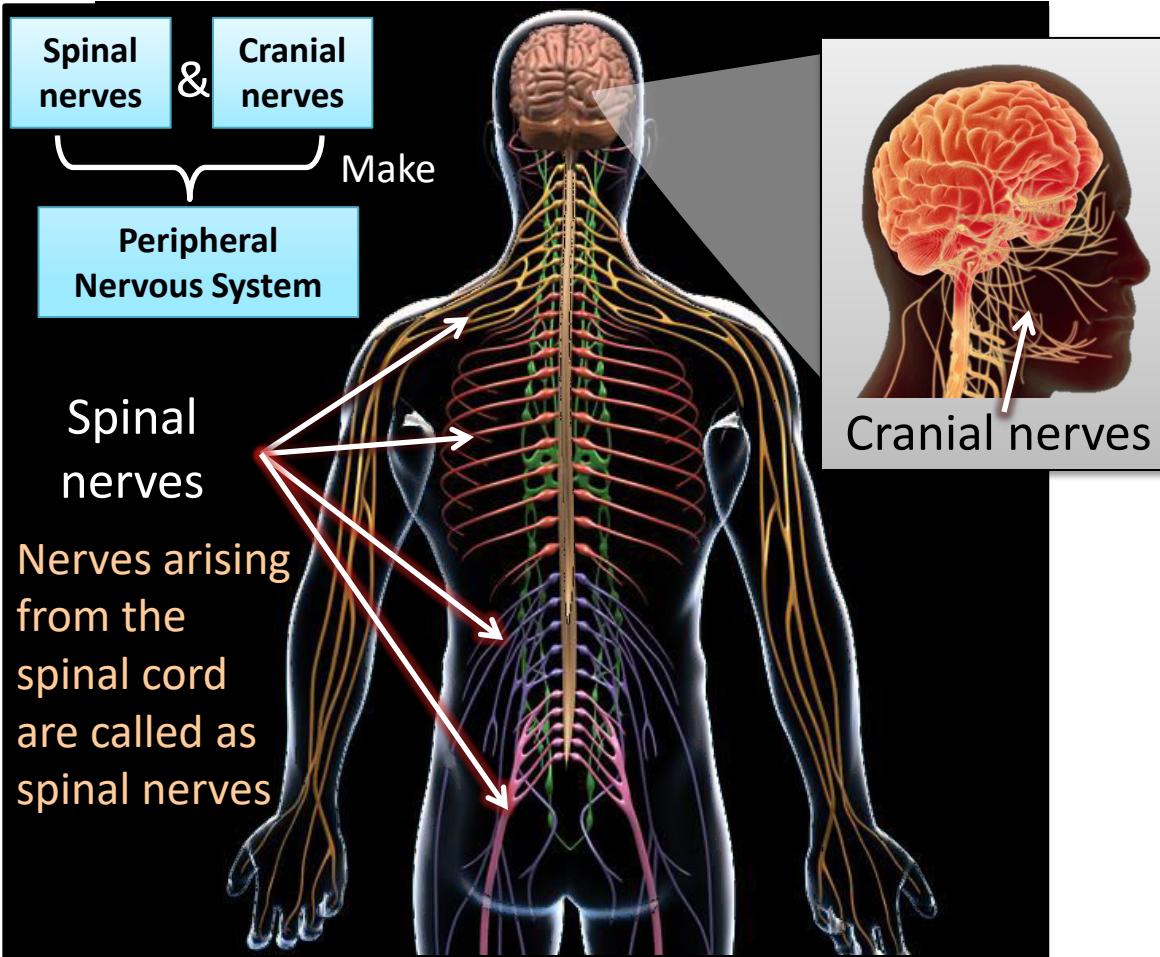
Central nervous system is a delicate structure composed of brain and spinal cord.

The long cavity of the spinal cord is called as central canal.



Function of CSF :

- ▶ Nourishment
- ▶ Protection by absorbing mechanical shock



Nerves arises from the brain are called as cranial nerves



Running

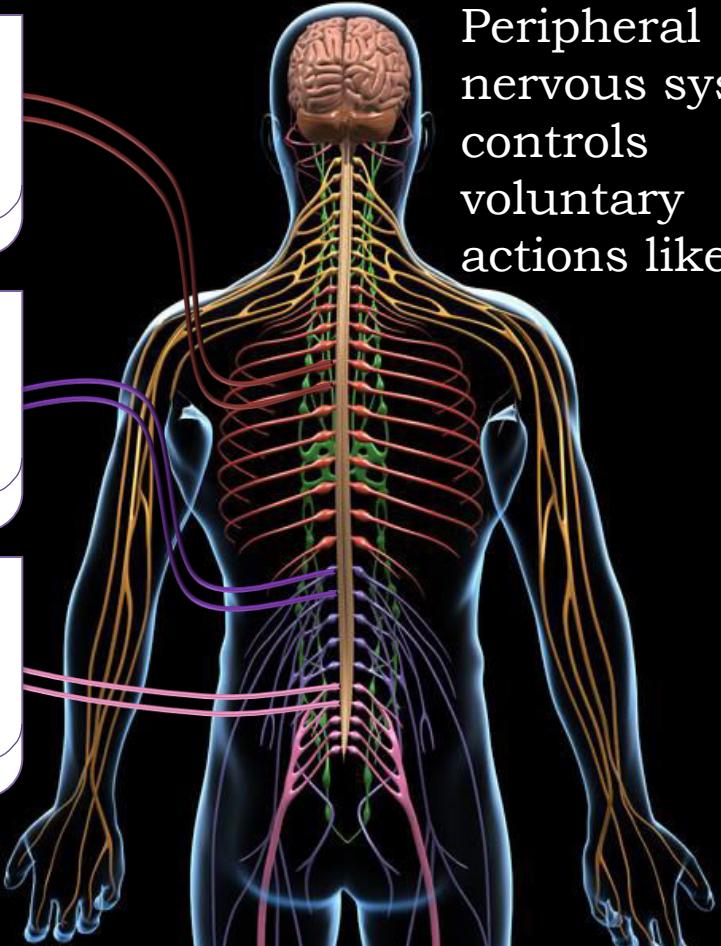


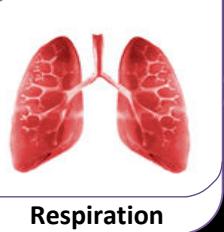
Clapping



Playing

Peripheral nervous system controls voluntary actions like

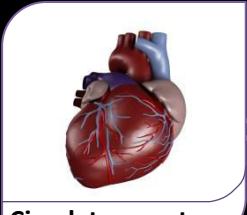




Respiration

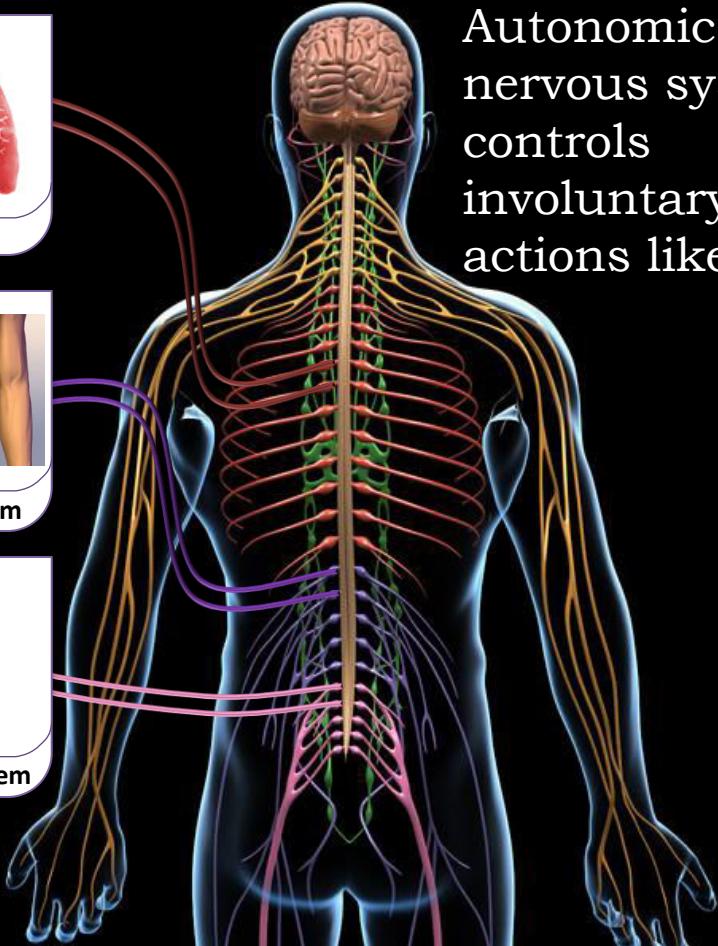


Digestive system



Circulatory system

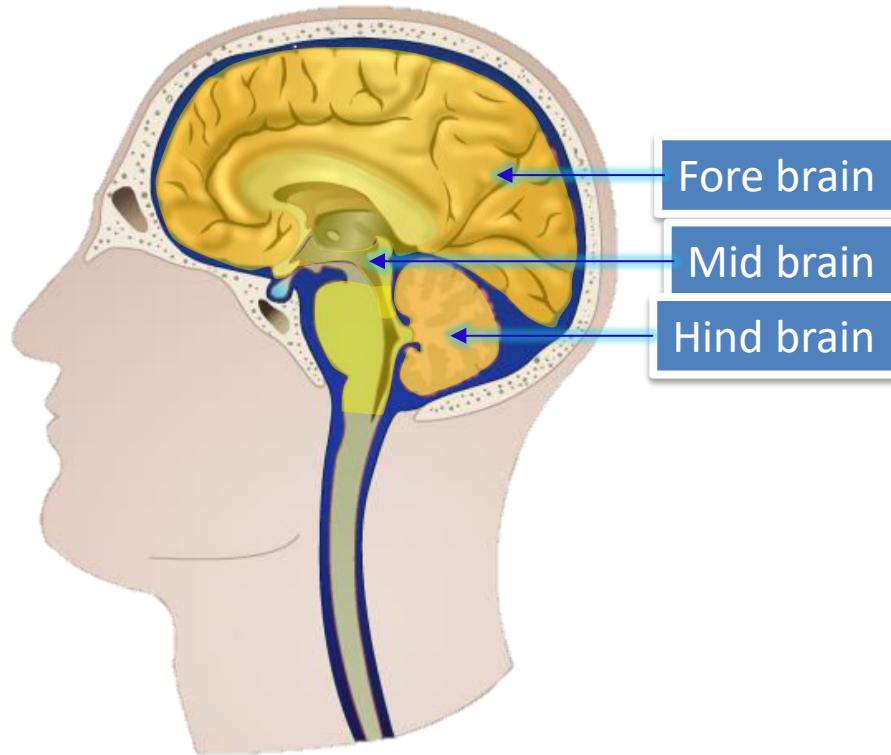
Autonomic nervous system controls involuntary actions like



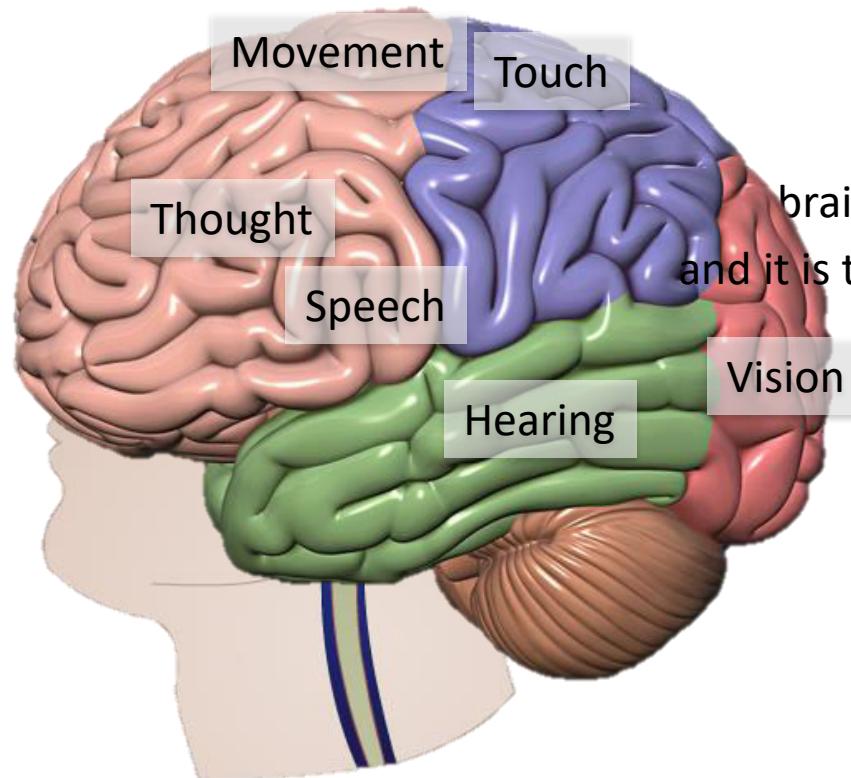
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Module 17

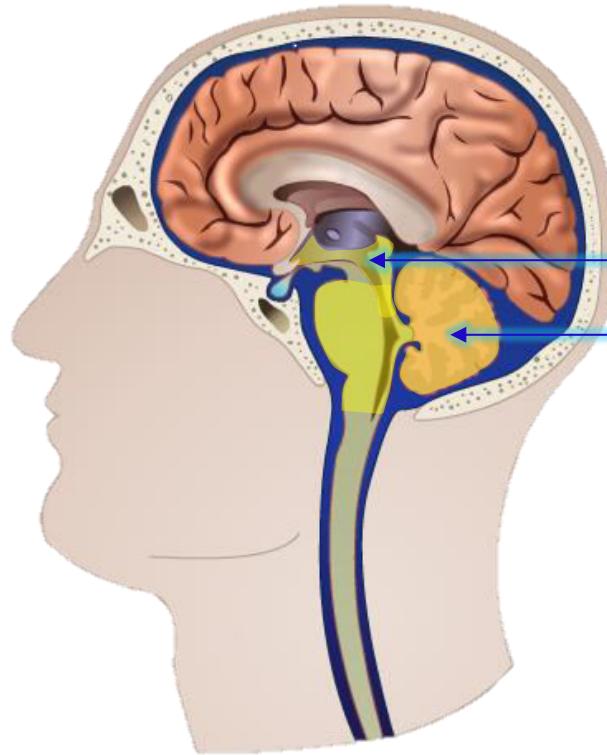
Brain is divided into three main regions which are



There are different areas for smell hearing vision etc.

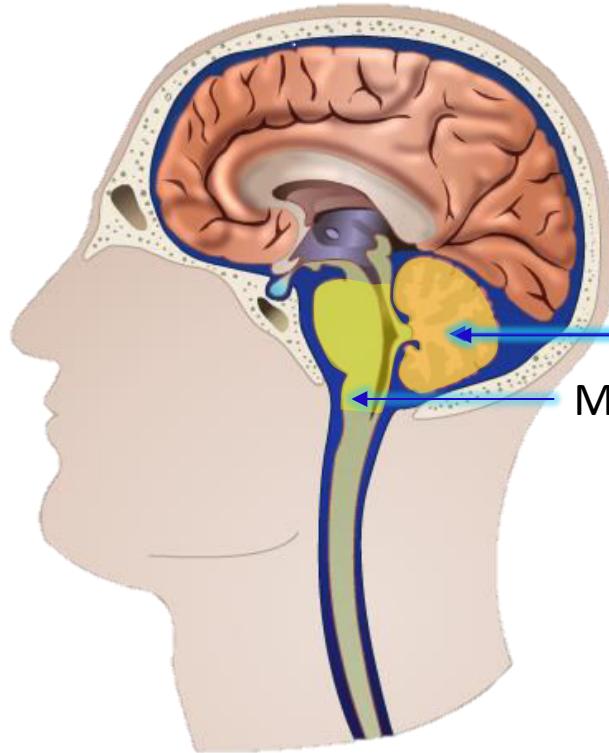


brain is also called as Cerebrum and it is the main thinking part of the brain.



Mid brain and
Hind brain
Controls
involuntary
actions

Mechallus oblongata controls movement and coordinates voluntary activities.



consists of

Cerebellum

Medulla oblongata

Thank You

Module 18

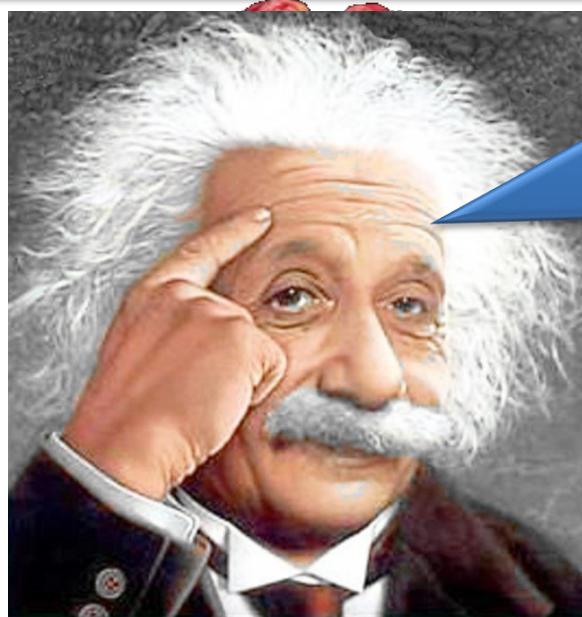


Let's see some interesting
facts about brain



750 – 1000 ml of blood flows through the brain every minute

more neurons than the right hemisphere



Einstein's brain weighed
1230 gm, less than average
Weight of human brain
which is approximately
1300 to 1400 gm

Brain can stay alive for 4 – 6 minutes without oxygen after that cells begins to die

Left side of the brain controls
Speaking
Writting
And Logical thought

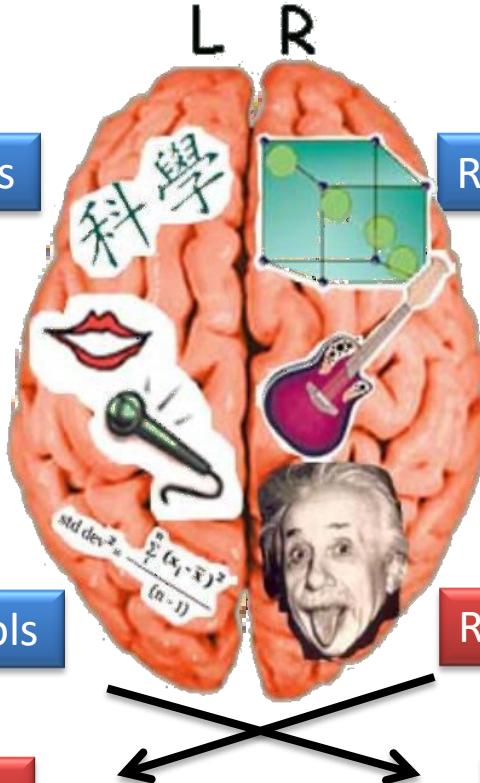
Right side of the brain controls
Artistic abilities

Left side of the brain controls

Left part of the body

Right side of the brain controls

right part of the body



MEMORY are of three types

How does our
memory work ?



SHORT TERM
MEMORY

LONG TERM
MEMORY

*Tells us
What is happening
around us which
is called as*

SENSORY
MEMORY

Lasts only for

BRIEF
MEMORY

30 SECONDS

*Is what we
have*

LEARNED
&
MEMORIZED

Thank You

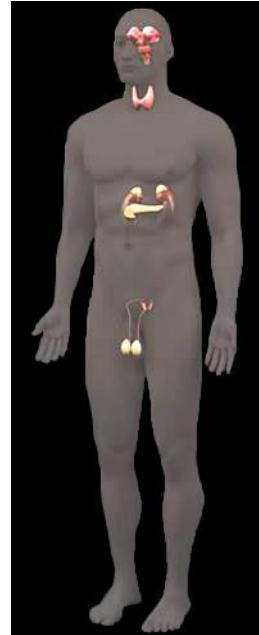
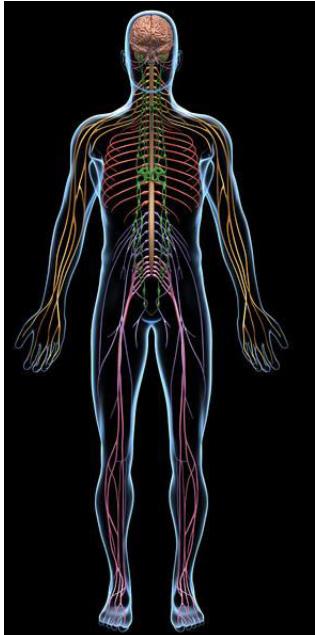
Module 19

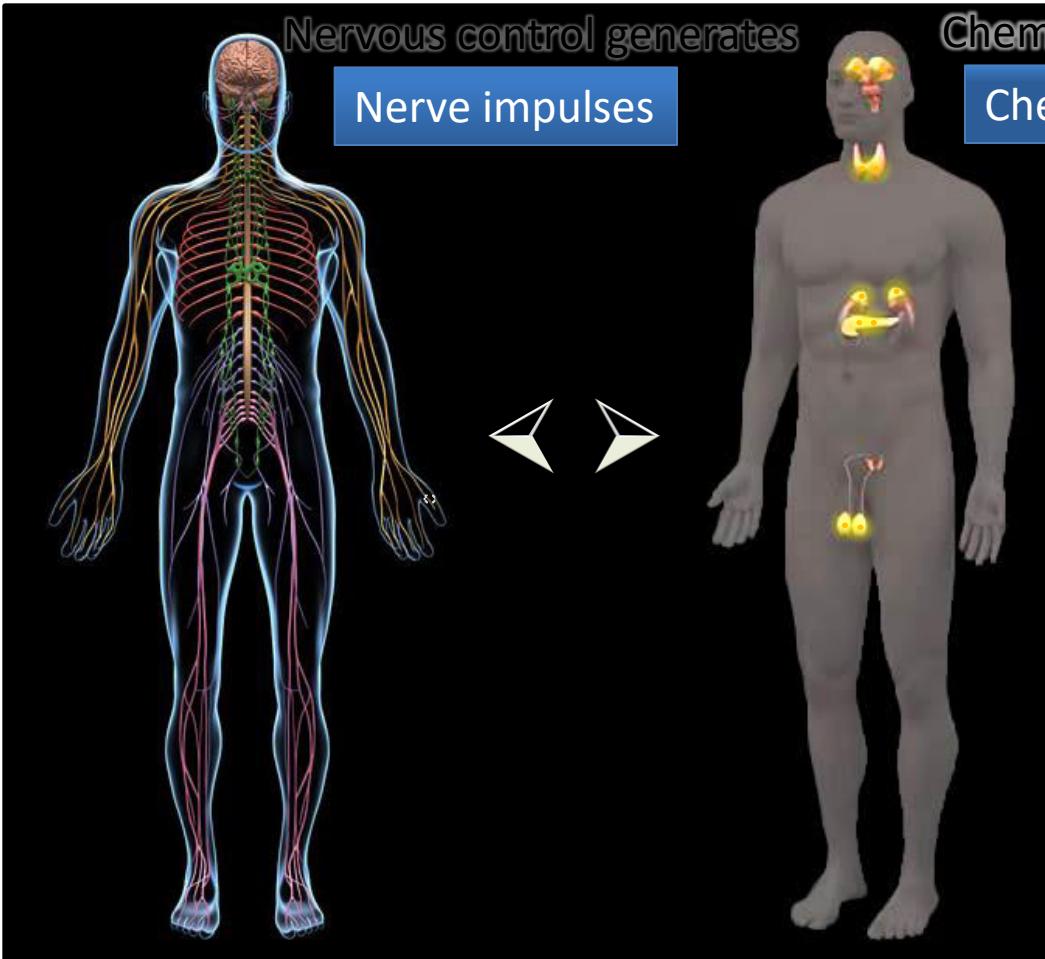
Control and co-ordination

are of two types

Nervous control

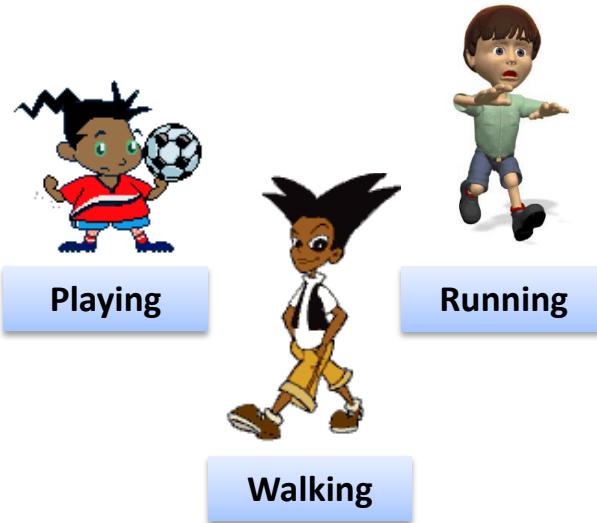
Chemical control

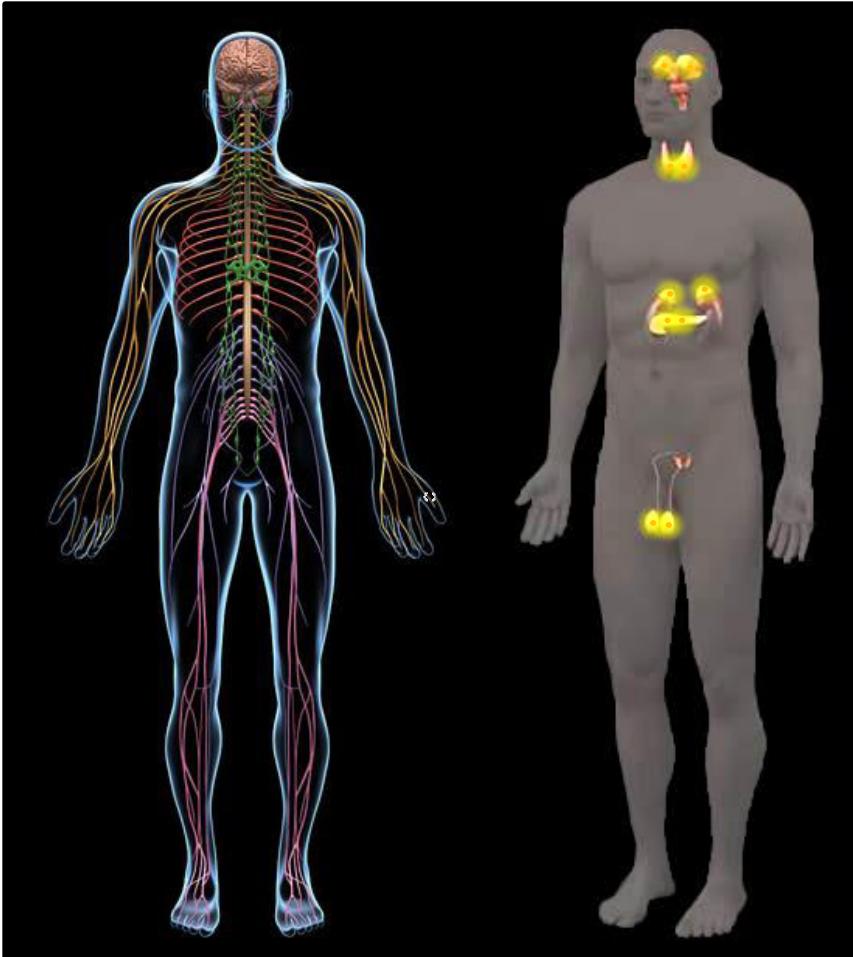




Chemical control generates
Chemicals or hormones

Both systems work in coordination to integrate and control various body activities like





- Nervous system generate electric impulses.
- Endocrine system generate hormones.
- Nerve impulses are rapid and are usually of short duration.
- Hormonal action is much slower and long lasting.

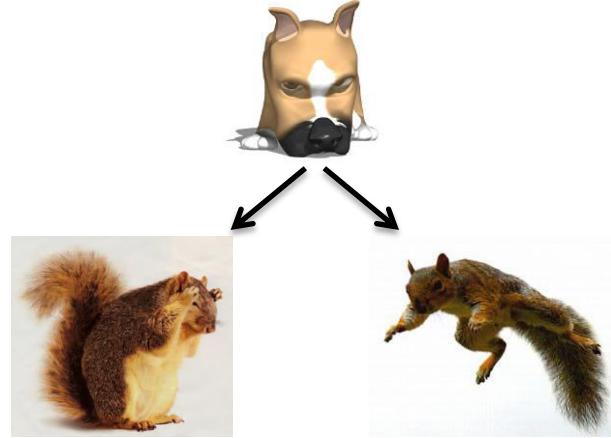
Thank You

Module 20

What do some animals, for instance squirrels experience when they are in scary situation?

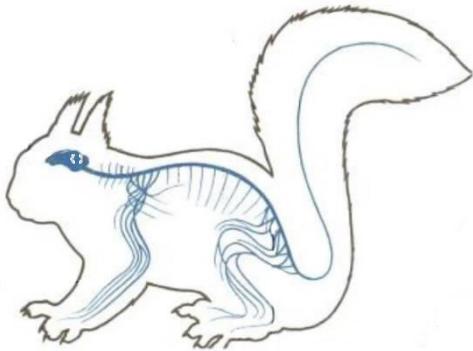


- When squirrel experiences a scary situation.
- Its body prepare for either fighting or running away
- Both are very complicated activities that will use a great deal of energy
- Many tissue types will be used and their activities integrated together in these actions.
- Two alternate activities fighting or running are different.
- Body should prepare for ideal activity in such cases.
- How would this be achieved.



- If the body design in the squirrel relied only on electric impulse via nerve cells

depends



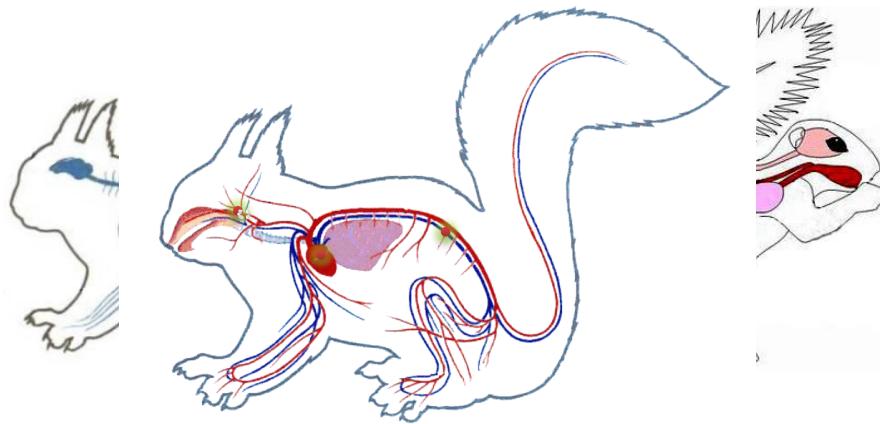
- Range of tissues instructed to prepare for the coming activity would be limited.

- If the body design relied only on chemical impulse via glands.

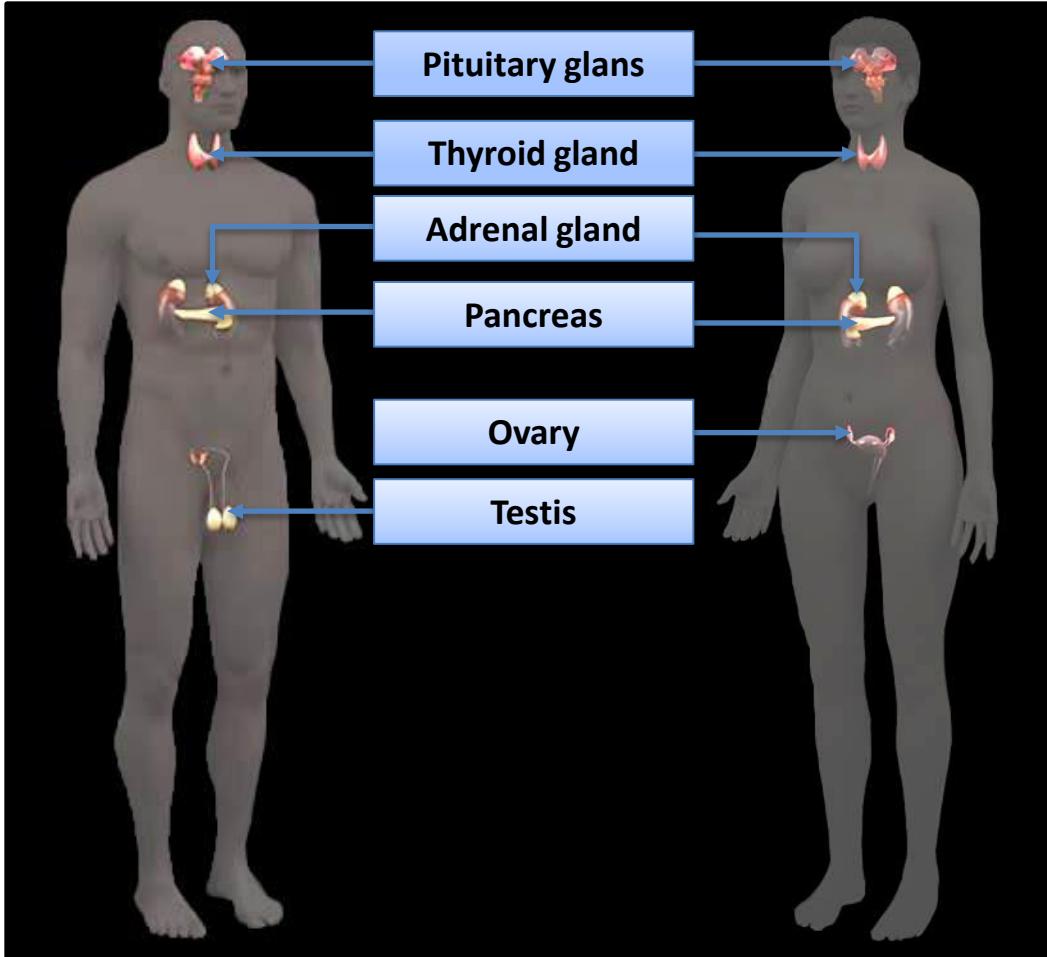


- Range of tissues instructed to prepare for the coming activity would be limited.

- If the body design in the squirrel relied both on electrical and chemical impulse.



- Then the signals would reach all cells of the body and provide the wide ranging change needed.
- This is done in many animals including human beings.



- Endocrine system consists of glands and adhesions that secrete hormones.
- Let us see few **endocrine glands** of the body.

All these responses together enable the body to deal with the situation and the boy can sway.







Thank You

Module 21

- Let us see some examples to understand how hormones helps in coordinated growth



Thyroid gland

Secretes

Thyroxin hormone

Which
regulates

Controlled

Carbohydrate, protein
and fat metabolism in
body
Breaking down of complex
food into simple molecules
to produce energy

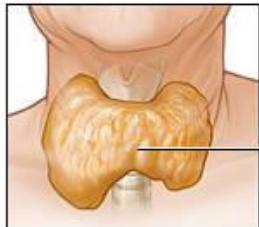
Iodine is essential for the synthesis of thyroxin

If iodine is deficient in diet

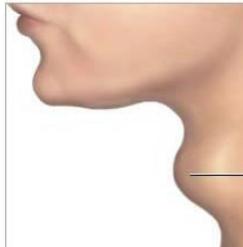
Thyroxin hormone decreases

Formation

↓ which causes



Enlarged
thyroid
gland



Goiter

Goiter



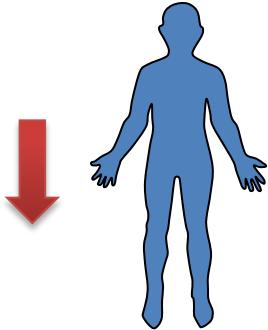
Pituitary gland

Secretes →

Growth hormone

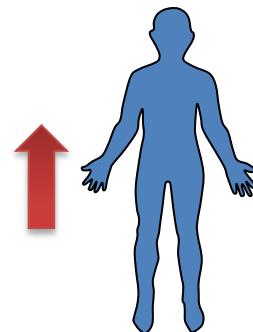
Which
regulates →

Growth and
development of
the body



If growth hormone
is deficient in
childhood, it
causes dwarfism

If growth hormone
is increased, it
causes gigantism





Secretes → Testosterone in males

Development of secondary
sexual characters like beard,
heavy voice

Testis

Due to secretion of testosterone boy attains puberty

Age 1 to 10



11 and above





Ovary

Secretes
→ Oestrogen in females

Development of secondary
sexual characters.

Due to secretion of Oestrogen girl attains puberty

Age 1 to 10



11 and above



Thank You

Module 22

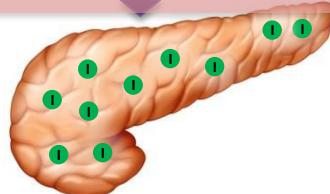
- If it is so important that hormones should be secreted in precise quantities, we need a mechanism through which it is done.
- The timing and amount of hormones released are regulated by, feedback mechanism.
- Let us see feedback mechanism.

exact

Controlled

If the glucose concentration increases in the blood the increased glucose level is detected by the cells of the pancreas

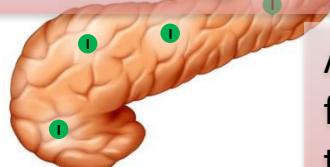
Feedback mechanism



The cells of the pancreas responds to the situation by producing more insulin.



Insulin reduces the glucose concentration in the blood



As the sugar level of the blood falls, the secretion of insulin by the pancreas is reduced

Thank You