

Vu Literature & Education Department

Composed By Zainab Arshad

HANDOUTS:
PROTECTION, SUPPORT AND MOVEMENT

Final Term
preparation From
Lectures 80 to 81

Lecture No: 80

Skin sensors of

heat and cold:

Sensors of

temperature or

Thermo receptors

are also bare nerve

endings. They are

located in **epidermis**
or dermis of the
mammalian skin.

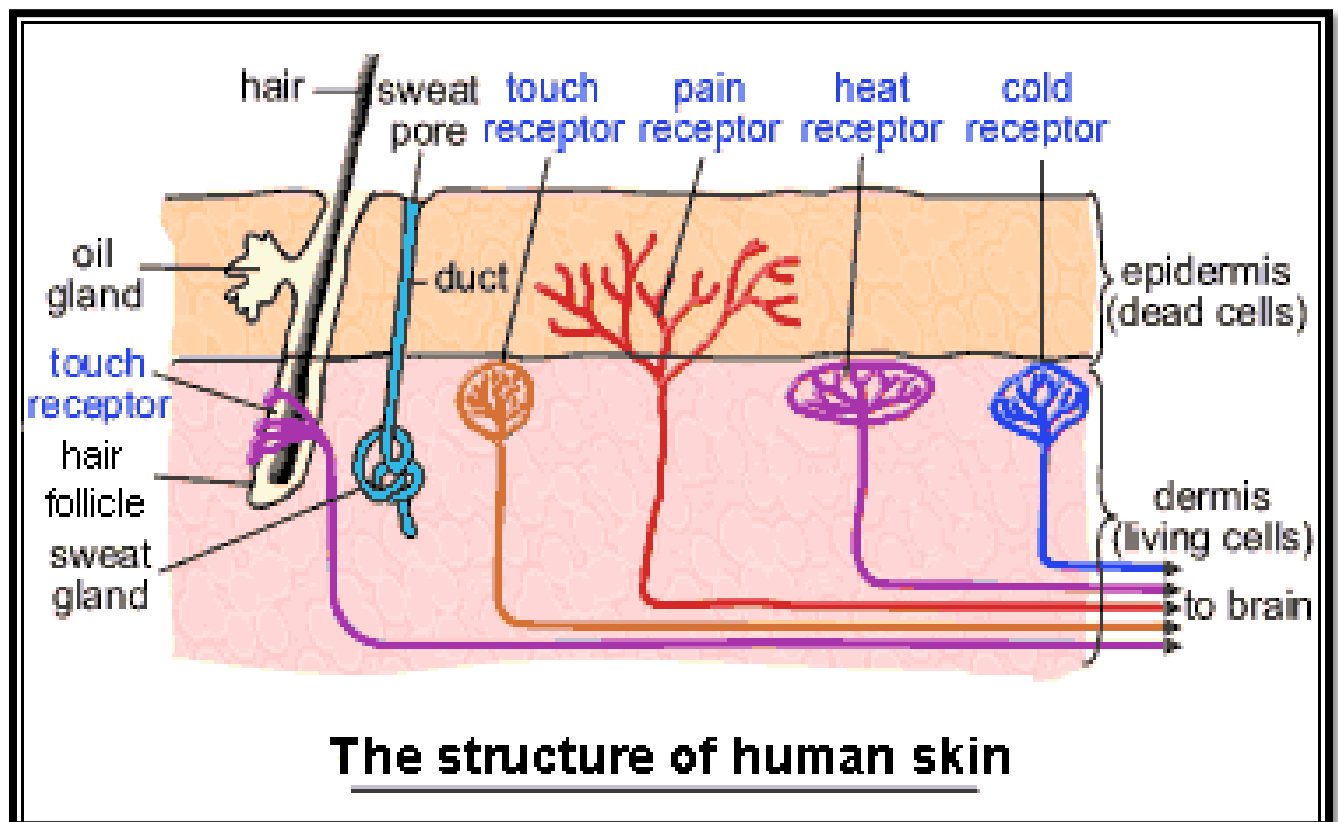
Mammals have
different areas
sensitive to heat and
cold. Cold receptors
respond to

temperature below
skin temperature.

Heat receptors
respond to
temperature above
skin temperature.

The ability to
detect changes in

temperature has
become well
developed in a
number of animals.



For example **Pit**
organs
(Additional, Vipers,
pythons and boas
have holes on their
faces called pit
organs, which
contain a membrane
that can detect

**infrared radiation
from warm bodies
up to one metre
away. At night,
the pit organs allow
snakes to 'see' an
image of their
predator or prey —
as an infrared
camera does —**

giving them a
unique extra sens)
in rattlesnakes



And vipers.

Lecture No: 81

Skin Sensors of

Mechanical Stimuli

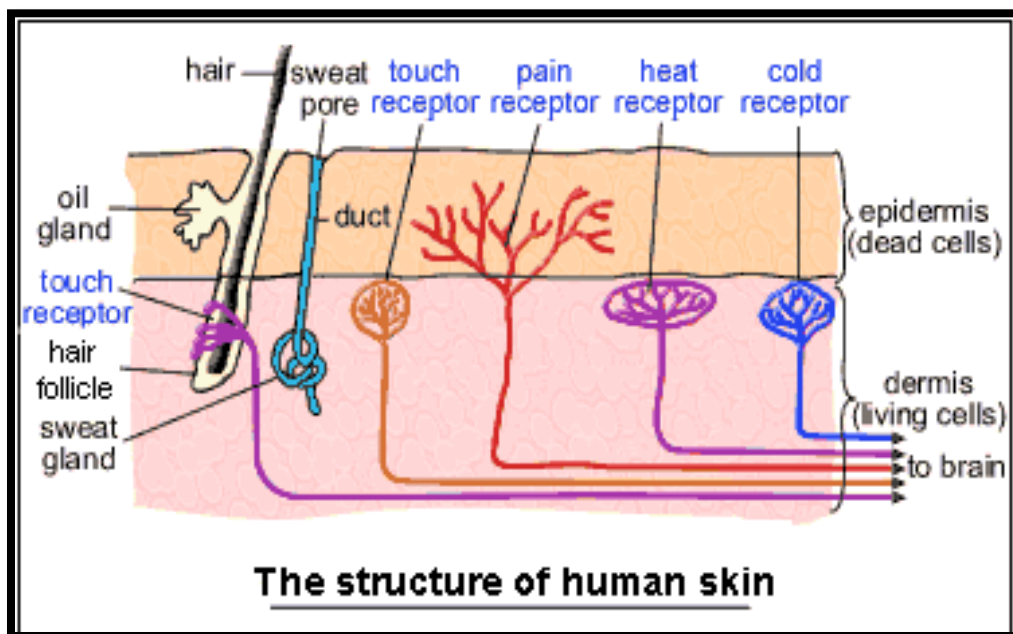
To obtain
information from
the environment,
the animals rely on
tactile stimuli.

Following are the
mechanical
receptors found in
the skin.

i) Bare sensory
nerve endings:

These are widely
distributed

receptors in the vertebrate body and are involved in pain, heat and feeble pressure.



ii) Tactile

(Meissner's)

corpuscles: They

are a type of

nerve endings in

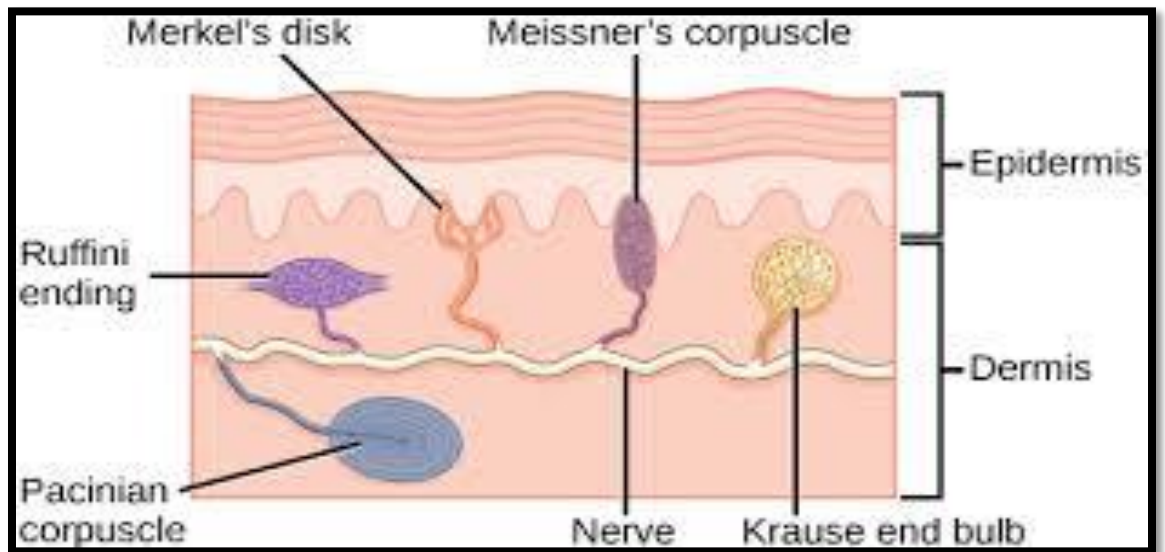
the skin that are

responsible for

sensitivity to
light touch.

iii) **Bulbs of
Krause:** the
receptors found
in dermis in
certain parts of
the body that

respond to
physical position
changes.



iv) : These are
Pacinian

corpuscles

responsible for
sensitivity to
vibration and
pressure.

v) Organs of

Ruffini: Detect
stress

deformation
within joints and
warmth. Many
mammals have
specially adapted
sensory hairs
called Vibrissae
on their wrists,

snout, eye brows
and whiskers.

Around the base
of each vibrissa
is a blood sinus.

Nerves bordering
the sinus carry
impulses to the

brain for
interpretation.

Vu Literature & Education Department

Zoo301 Short

Lecture from 82 to

90

Mcqs, Short and
long questions:

Composed By Zainab
Arshad

Lectures 82:

S.Q: Define and explain

**Sonar or
Echolocation**

Additional

**(SONAR – Sound
Navigation and**

Ranging, is the process of listening to specific sounds to determine where objects are located. Echolocation – A method used to detect

**objects by
producing a
specific sound
and listening for
its echo)**

Sonar/biosonar/
Echolocation is a
physiological
process for

locating distant
objects by means
of sound waves
reflected back to
the **emitter**
(such as a bat) by
the objects.

Echolocation is

used for
orientation,
obstacle
avoidance, food
procurement, and
social
interactions.

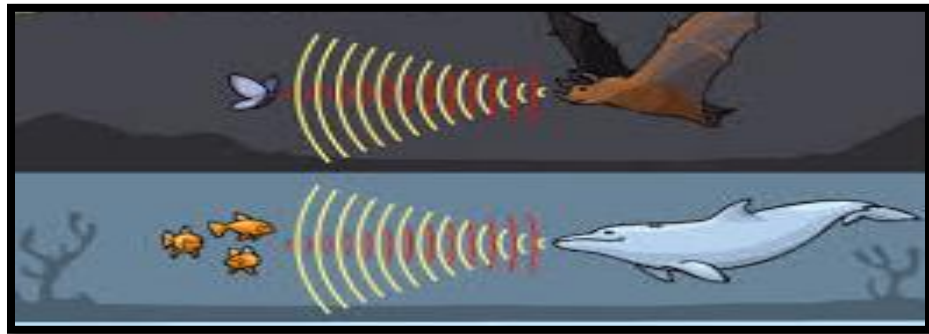
MCQ: Example:

Other animals
which have this
sense of sonar
are, shrews,
several cave
dwelling birds,
whales, and
dolphins.

Mcq: These animals emit **high frequency** sounds which return after bouncing off objects in the environment. The returning

waves from the
object (e.g. flying
insect) provide
enough
information for
the bat to **locate**
and catch the
prey. This

process lasts for
(**MCqs**) **2-3**
milliseconds and
is repeated
several hundred
times per second



83 Smell or olfaction:

The sense of
smell or olfaction
is(mcqs) due to
the olfactory
neurons
(receptor cells)

present in the
roof of **nasal**
cavity of the
vertebrates.

These receptor
cells are densely
packed. In **dog**,
there are more

than 40 million
olfactory
receptor cells
per square
centimeter. Each
olfactory cell
ends in a tuft of
cilia containing

receptor site for
various
chemicals.

How odor is
perceived?

Odor molecules
physically
interact with

protein
receptors on the
plasma
membrane. This
interaction alters
membrane
permeability and
leads to

generator
potential.

84 Olfactory

senses in various

vertebrates:

In Fishes

S.Q: WHY FISHES MIGRATE

Most of the
fishes such as
Lamprey and
Salmon return to
spawn in the

same stream in
which they
hatched years
earlier. Their
migration in the
streams often
involves
distances of

hundreds of km.

This migration is
guided by fishes'
perception of
characteristic
odor of their
spawning stream.

In amphibians

Define
Jacobson's
organs?

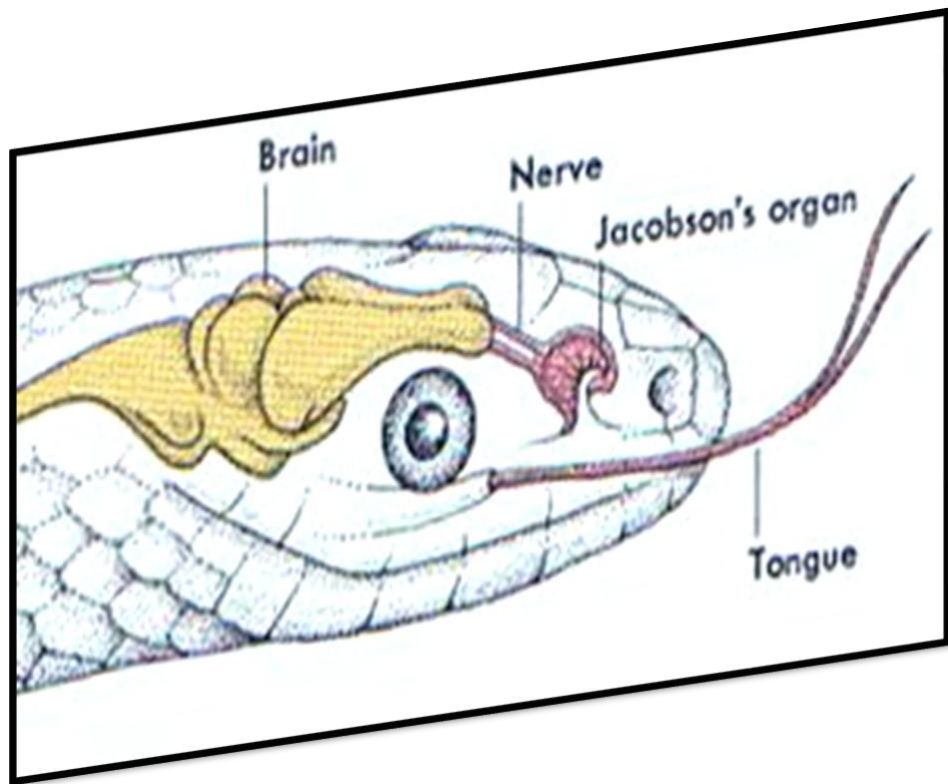
Olfaction is used
to detect noxious
chemicals, food
and mate. In
reptiles olfaction

is better adapted
than in
amphibians.

Jacobson's
(vomeronasal)

organ: Apart
from olfactory
epithelium most

reptiles possess
Jacobson's
organs. These
organs are best
developed in
snakes and
lizards.



Jacobson's organ
is a spherical
structure having
a narrow duct

that opens into
mouth. The
protrusible,
forked tongue of
snakes is used to
take sample of
air borne
chemicals. Snake

flicks the tongue
out take the
sample and then
moves to the
Jacobson's organ
which perceives
odor molecules.

S.Q: Use of
Jacobson's
organs in
Turtles and
Tuatara?

Turtles and
Tuatara uses the
Jacobson's organ

to taste objects
held in **oral**
cavity. In birds
olfactory
epithelium is
poorly
developed, so
olfaction plays

minor role in the
lives of birds.

Exceptions are
vultures. They
locate dead and
dying prey
largely by **smell**.

Lecture No:85

Taste or gustation:

MCqs: Taste

receptors are
the

chemoreceptors.

MCqs: Tongue is

the primary

organ of taste.

The tongue is equipped with many taste buds housed in papillae on its dorsal surface. Papillae give the tongue a

bumpy

appearance.

S.q: Why sugars
are sweet?

All sugars are
sweet because
they contain OH
groups with a

particular
orientation that
can interact with
the taste
receptor for
sweetness in our
tongues.

Lecture No: 86

Taste in various
vertebrates:

mcqs:

Vertebrates
other than

mammals may

have taste buds

on other parts
of the body.

Taste buds are
inside the fish's
mouth, on its
tongue and
scattered all
over the body

including barbles
and fins.

However, some
birds have an
acute sense of
taste. Extensive
research into
bird senses has

shown that

vultures,

seabirds, kiwis

and parrots have

well-developed

olfactory glands,

giving them some

sense of smell
and taste.

Lecture No: 87

Photoreception:

S.Q: Define

Photoreception?

Photoreception

/Vision is defined

as any of the
biological
responses of
animals to
stimulation by
light.

Photoreception
refers to

mechanisms of
light detection
that lead to
vision

**MCQ: Vision
depends on
specialized
light-sensitive**

cells called
photoreceptors,
which are located
in the eye. The
quality of vision
provided by
photoreceptors
varies

enormously
among animals.

MCQS: Simple

eyes are present

in.....?

Some simple eyes
such as those of
flatworms have

few

photoreceptors

and are capable
of determining
only the
approximate
direction of a
light source.

Lecture No 88:

Anatomy of

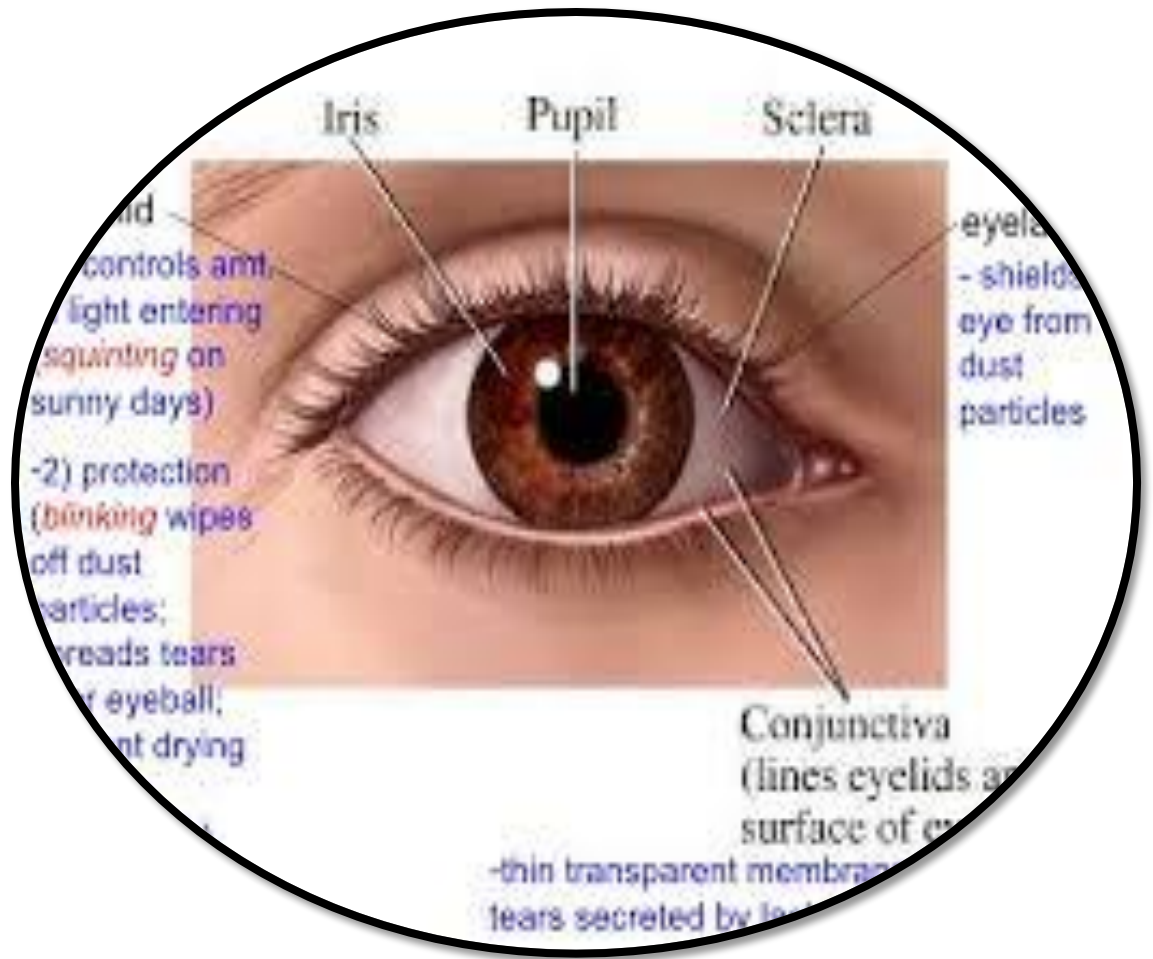
Human eye:

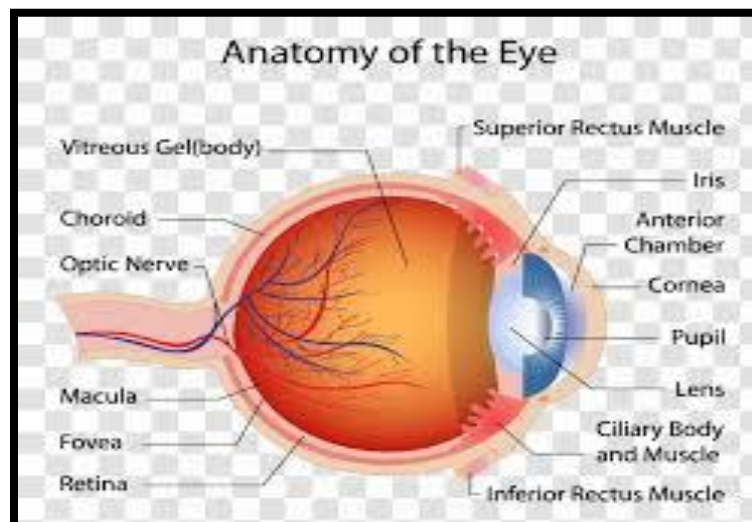
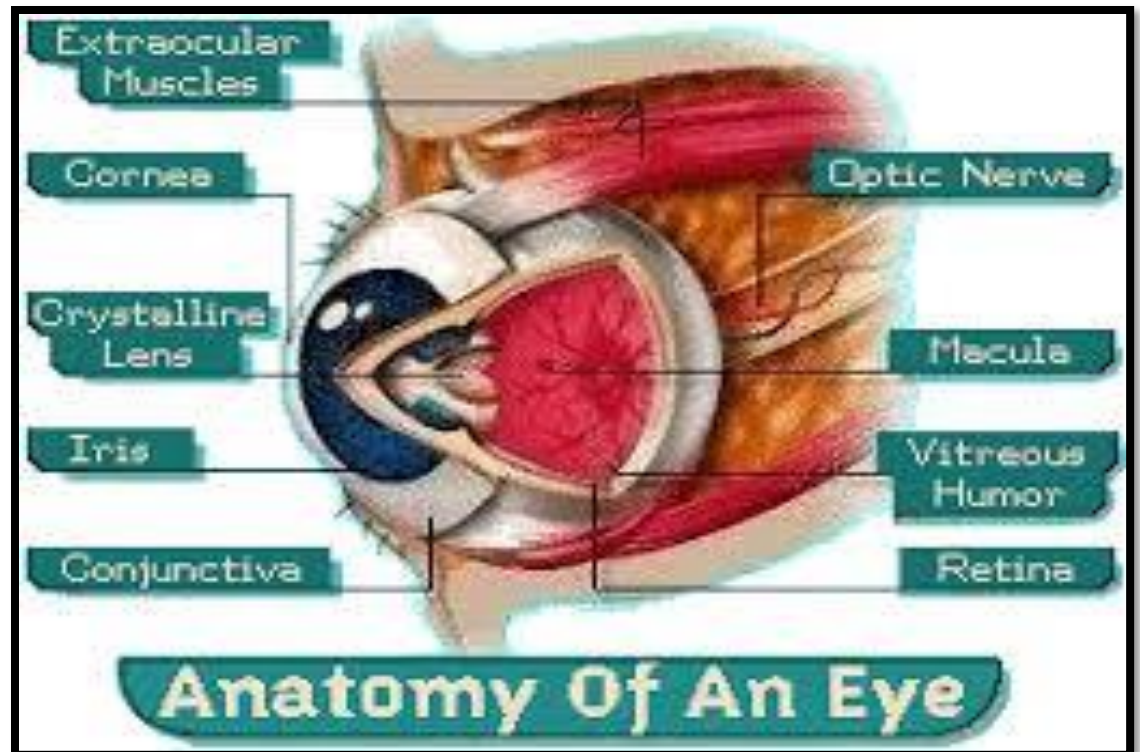
S&L Q:

Describe the

composition of

human eye.





The eye is
composed of the
anterior and the
posterior
segments.

MCqs: The
anterior segment
is made up of the

cornea, iris and
lens.

Mcqs & SHORT
QUESTION:

Define cornea?

The cornea is

transparent and
more curved, and

is linked to the
larger posterior
segment.

MCQS: The
posterior
segment is
composed of the
vitreous, retina,

choroid and the
outer white shell
called the **sclera**.

The transparent
cornea is
continuous with
the **sclera** and

covers the front
of the eye ball.

MCQs: Choroid
tissue also
extends the
front of the eye
ball to form iris,
ciliary body and

suspensory
ligaments.

MCQs: The
cornea is about
11.5 mm in
diameter, and
1/2 mm in
thickness.

MCQS: S.Q

define iris and

what is its

composition?

The iris is the
circular
pigmented
structure which

is composed of
radial and
circular muscles
surrounding the
center of the
eye.

S.Q & Mcqs:

Define Pupil:

The pupil is an aperture which appears to be black present in the center of iris. The size of the pupil is adjusted by the

iris muscles. A

clear fluid, the

aqueous humor

fills the anterior

chamber and

jelly-like vitreous

humor fills the

posterior

chamber. The retina is the innermost light sensitive layer composed of rods and cones.

S. Q what is size of eye ball?

The size of the eye ball is about 24 mm in diameter. At birth it is 16-17 mm and attains maximum size by 12 years of age.

However, the
maximum
increase is within
three years.

S.Q: Define
conjunctiva?

The moist
mucous

membrane that
covers the eye
ball is the
conjunctiva. The
fovea is a tiny pit
in the retina
aligned with the
central axis of

the lens. Fovea
contains closely
spaced **cones** (**no
rods**) and
produces the
highest visual
resolution

anywhere on the
retina.

Lecture No: 89

**Accommodation
of eye:**

S.Q: Define

Accommodation

L.Q: EXPLAIN

THE

Accommodation

of eye

Underline mcqs:

Accommodation

is the

adjustment of

the optics of the eye to keep an object in focus on the retina as its distance from the eye varies. It is the process of adjusting the

focal length of a lens.

Accommodation is the ability of the eye lens to see both near and distant objects by

adjusting its
focal length.

S.Q: Define
near point
vision?

The minimum
distance at which

the eye can see
objects clearly is
called near point
vision. The
farthest at
which the eye
can see objects

clearly is called
far point vision.

Lecture No: 90

Adaptation of

Amphibians Eye

L.Q: Explain the

Adaptation of

Amphibians Eye

**S.Q: write a
note on fish
eyes?**

Fish eyes:

Eyes of fishes
are similar in
most respects to
the eyes of other

vertebrates in
both structure
and function.

However, fish
eyes are without
eye lids. Lens is
spherical and
close to cornea.

Focusing requires
moving the lens
forward and
backward.

Amphibian Eye:
In anurans and
salamander eyes
are close

together on the
front of head
and have

binocular vision.

Some
salamanders have
smaller and
lateral eyes and

lack binocular
vision. Laterally
placed eyes
permit such
animals to see
well off to their
sides.

S.Q: Define

Binocular vision

Binocular vision is a type of vision in which an animal having two eyes is able to perceive a single

three-
dimensional
image of its
surroundings.

91 Vision in
Reptiles Eye in

Reptiles are similar in structure to those of amphibians. Most reptiles have a ring of bones around each eye

that supports
the eyeball
except crocodiles
and snakes. Some
lizards and
tuatara contain a
third eye called a
parietal eye,

located on the
top of their
head. This eye
develops from
optic tatum
(midbrain) This
eye contains a
cornea, lens, and

retina like the
lateral eyes.

Snakes do not
possess eyelids.

A scale that is
actually part of
the skin, a
spectacle,

protects the eye.

Most reptiles
possess upper
and lower eye
lids, nictitating
membrane that
protect and
cleanse the

surface of the
eye. Usually, non-
poisonous snakes
have round pupils
while poisonous
snakes have
elliptical pupils.
Most reptiles

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eye. Usually, non-

poisonous snakes
have round pupils
while poisonous
snakes have
elliptical pupils.

92 The structure
of bird eye is
similar to that of

other

vertebrates.

Birds are highly
visual animals
with unique
features and
adaptations that
allow them to fly.

But they have a
number of
adaptations
which give visual
acuity superior
to that of other
vertebrate
groups. Birds

have unique
double focusing
mechanism

Padlike
structures
control the
curvature of the
lens and ciliary

muscles. Also
change the
curvature of the
cornea.

Instantaneous
focusing of both
allows the bird of
prey to descend

down rapidly to
catch fish.

judgment of
distances.

Nocturnal
species have but
a high density of
rod cells which

function well in
poor light. Birds
can see
ultraviolet (UV)
light because
their lenses and
other ocular
media transmit

UV. They possess
a class of
photoreceptor,
which is
maximally
sensitive to
violet or UV
light, depending

on the species.

93 Functioning of

eye The retina is

a thin layer of

tissue that lines

the back of the

eye on the inside.

The retina is a

light-sensitive
layer which is
composed of
pigmented
epithelium, that
covers the
choroid layer.

Nervous tissue

that contains
photoreceptor
cells lies on this
basement layer.

The

photoreceptor
cells are called
rod and cone

cells. Rods are sensitive to dim light whereas cones respond to high intensity light and involved in color perception. With

the help of the
cornea and
crystalline lens,
image is formed
on the retina
which transforms
it into nerve
impulses and sent

to the brain.

Chemistry of
Vision: Visual
perception in
humans occurs
through the
absorption of
electromagnetic

radiations by
photoreceptors
in the retina.

When rhodopsin,
a pigment in rod
cells, absorb
light energy. 94

Light, Eye Vision

Light is
electromagnetic
radiation that
has properties of
waves. The
electromagnetic
spectrum can be
divided into

several bands
based on the
wavelength. As
we have
discussed
before, visible
light represents
a narrow group of

wavelengths
between about
380 nm and 730
nm. Nature of
light is said to
dual i.e. it shows
characteristics
of both waves

and particles.

These particles

are called

photons when

comes into

contact with

matter. Photon as

the particle of

light has no
charge and
always move at
the speed of
light. The photon
has only energy
and no mass.

When a pigment

(rhodopsin) in a rod cell absorbs light energy, the energy that this reaction releases triggers the generator potential in an

axon and then an
action potential
that leaves the
eyeball via the
optic nerve to
the brain. When
the
photoreceptor

cells are not
being stimulated
(i.e., in the dark),
vitamin A and
energy from ATP
convert
rhodopsin back
to its light-

sensitive form.

Fovea In the middle of the retina is a small dimple called the fovea or fovea centralis. This is the center of the

eye sharpest
vision and the
location of most
color perception.
Our perception
of color is based
on perception of
the light

wavelength. Blue,
yellow and red
are the primary
colors. These
colors contain
only one
wavelength so
they are called

pure colors. 95

Common eye

defects Myopia

(nearsightedness

), Hyperopia

(farsightedness)

and Astigmatism

are common eye

defects. They
are often called
"refractive
errors". Cataract
Glaucoma
Nearsightedness
or Myopia, is a
vision condition in

which close
objects are seen
clearly, but
objects farther
away appear
blurred.

Farsightedness
or hyperopia, is a

vision condition in which distant objects are seen clearly, but close objects does not come into proper focus. Hyperopia occurs if the

eyeball is too short. Light entering the eye is therefore, not focused correctly.

Astigmatism is a vision condition

that causes
blurred vision
due to the
irregular shape
of the cornea or
the curvature of
the lens inside
the eye. the light

entering the eye
is not focused
correctly

Cataract is a
condition that
occurs when the
inner lens of the
eye becomes

darkened or
opaque. Glaucoma
is a disease
which damage
the eyes optic
nerve and can
result in vision
loss and

blindness. 96

Shining eyes: Eye shine can be seen in many animals.

Eye shine occurs in a wide variety of colors including white,

blue, green,
yellow, pink and
red. Eye shine is
a type of
iridescence. E.g
Soap bubbles,
sea shells: Eye
shine is a visible

effect of the
tapetum lucidum

Tapetum is a
layer of tissue in
the eye of many
vertebrates. It
lies immediately
behind the

retina. When
light shines into
the eye of an
animal having a
tapetum, the
pupil appears to
glow. The
tapetum lucidum

functions as a
retro reflector.

It reflects
visible light back
through the
retina, increasing
the light
available to the

photoreceptors.

97 Summary of
the Chapter Part
I 98 Summary of
the Chapter Part
II 99 Summary
of the Chapter
Part III