The Sense Organs

The Eye

-sight is our most important sense, giving humans 80% of the information about our outside world
-the eye is a very complex and valuable organ
-it is protected by eyelashes, eyebrows and ridges of bone

Structure - the walls of the eye are made of three layers:

-the outermost **sclera** is the thick white layer that provides shape
-a bulge in the front of the sclera is the **cornea**, which is transparent to allow light to pass through
-the sclera and cornea are covered in a thin clear membrane called the **conjunctiva** that is kept moist by the tear gland

-the middle layer is the dark-red, brown coloured **choroid layer**
-function is to absorb light and prevent internal reflection
-at the front the choroid becomes the **iris**
-the iris is the coloured part of the eye
-in the centre of the iris is an opening called the **pupil**
-the iris opens and closes to change the size of the pupil in responses to light
-in dim light the pupil **dilates** or opens to allow more light in and has the opposite effect of constriction under intense light
-behind the iris the choroid forms the **ciliary body** which has muscles that change the shape of the lens
-the lens changes shape as we look at objects near or far, focussing the light on the back of the innermost layer the **retina**

The inner layer the retina
-made up of 2 types of photo receptors, **rods and cones**
- cones require a lot of light to be stimulated but can detect colours: red, green, and blue
- rods require less light but can not distinguish colours (effective for night vision)
Other parts of the eye

Fovea centralis- region used for fine focusing located directly behind the lens

blind spot- area void of rods or cones area where ganglion cells exit the eye through the optic nerve, no image can be formed from light that hits the area

optic nerve- located at the rear of the eye, the nerve that carries impulses from the receptors in the retina of the eye to the brain

the lens divides the eye into two chambers, an anterior chamber at the front between the cornea and the lens, this chamber is filled with a fluid called the aqueous humour.
-the anterior chamber and the cornea acts to pre-focus the image before it hits the lens

Behind the lens is the posterior chamber, filled with a clear gel called vitreous humour which helps maintain the shape of the eyeball.

Path of light through the eye

-light entering the eye passes through the cornea, aqueous humor, pupil, lens, and vitreous humour, and forms an image on the retina.

Vision (How it occurs)

-Light entering the eye causes the pupil to dilate if not enough light, and constrict if too much

-the lens changes shape as well in response to distance of the object viewed, with a distant object the lens is flat(ciliary muscle is relaxed and the suspensary ligaments are taut
-when focussing on close objects the ciliary muscles contract and the suspensory ligaments relax causing the lens to become rounded this is called accommodation. (see fig. 12.20)

-the image is inverted and reversed on the three layers of the retina: the ganglion cell layer, bipolar cell layer, and the rod and cone cell layer.
-bipolar cells synapse with rods or cones and transmit impulses to the ganglion cells. The ganglion cells join together and form the optic nerve as they exit the eye

-the numerous rods and cones of the eye function using a purple pigment called rhodopsin, when light hits this pigment it splits into two proteins-retinal (vit. A) and opsin which provides the energy to stimulate a bipolar cell

-the three colours visible by the cones depend on different structures of opsin
Disorders of the Visual System. In your notebooks define each of the following:

nearsightedness (myopia)-

farsightedness (hyperopia) -

astigmatism-

colour blindness -

night blindness -

glaucoma-

Read page 413 and in your notebooks describe LASIK and corneal transplants
The Ear

The human ear has two sensory functions: hearing and keeping balance or equilibrium. The ear contains mechanoreceptors that change air movements into nerve impulses that the brain can interpret as sound.

The ear can be divided into three regions: an outer, middle, and inner ear.

The outer consists of the pinna and the auditory canal. The pinna acts as a funnel for sound waves, it is the outer part of the ear made of a flap of skin supported by cartilage. The auditory canal has tiny hairs and sweat glands which are modified to secrete a waxy material which prevents foreign objects from entering the ear.

The middle ear begins at a membrane called the eardrum or tympanic membrane and ends at two small openings called the round window and the oval window. Between the eardrum and the oval window we find the bodies three smallest bones, the malleus (hammer), incus (anvil) and the stapes (stirrup), these are called together the ossicles.

Between the middle ear and nasopharynx (throat) is the auditory or eustachian whose function it is to equalize air pressure between the outside of the body and the middle ear.

The inner ear consists of the cochlea, involved in hearing, and the vestibule and semicircular canals which are involved in balance. The semicircular canals are the vestibular canal, the cochlear canal, and the tympanic canal. The semicircular canals allow the body to maintain balance, these canals contain fluid and hairlike projections that detect changes in body position.

Hearing

Hearing begins when sound waves collected by the outer ear enter the auditory canal. The sound waves cause the tympanum to vibrate which causes the malleus to move which causes the incus and finally the stapes to move as well. The stapes passes the vibration onto the membrane of the oval window, which in turn causes the fluid in the cochlea to vibrate. The movement of fluid causes vibrations in the hair cells of the cochlear canal membrane.
to start impulses in the auditory or cochlear nerve which are carried to the cerebral cortex of the brain where they are interpreted.
-the more cells stimulated, the more impulses sent to the brain determines the sounds loudness

Disorders of the Ears

read page 415-416 “Disorders of the ears”
in your notebooks:
contrast nerve and conduction deafness
-describe: conventional, programmable and digital hearing aids
-describe treatments for fluid in the ear such as tympanostomy tube surgery