Are you a nature lover? Do you enjoy being out of the home under the shade of a tree enjoying the bliss of solitude and tranquility? Do you enjoy nature’s soft soothing breeze, flutter of wings, chirping, soaring of birds, the sweet fragrance of flowers, their colours, plucking a fruit and enjoying it under a tree? What helps you to enjoy the sounds and smell? When you hear thunder and see the lightening you run indoors. These are sensational experiences you acquire. Just as you enjoy listening to a song or watch a dance or a sport. All these experiences you gain through your sensory organs. You already know that your sensory organs are the eye, ear, nose, tongue and skin. They contain receptors. They respond to stimuli from the environment.
As the necessity demands, your reactions come automatically. If you see a vehicle coming towards you, you jump off the road. Your eye helped you to avoid an injury. When you get the signal to start a race you take off. The ear helped you to react. Sight, hearing, feeling, smell and taste are called the special senses.

### Assignment 9.1
Collect similar situations in your daily life that may cause you to react instantly. Name the sense organ connected to and the reaction.

<table>
<thead>
<tr>
<th>Experiences - stimuli or changes in the environment</th>
<th>Sensitivity</th>
<th>Sense organ</th>
<th>Motor action</th>
</tr>
</thead>
<tbody>
<tr>
<td>swaying of trees</td>
<td>sight</td>
<td>eye</td>
<td>look at trees</td>
</tr>
<tr>
<td>chirping of birds</td>
<td>hear</td>
<td>ear</td>
<td>listen to it</td>
</tr>
<tr>
<td>fragrance</td>
<td>feel the smell</td>
<td>nose</td>
<td>feel it</td>
</tr>
<tr>
<td>taste of a ripened mango</td>
<td>feel the taste</td>
<td>tongue</td>
<td>enjoy it</td>
</tr>
<tr>
<td>touch of a hot kettle</td>
<td>pain</td>
<td>skin</td>
<td>feel it and take off the hand</td>
</tr>
</tbody>
</table>

As the necessity demands, your reactions come automatically. If you see a vehicle coming towards you, you jump off the road. Your eye helped you to avoid an injury. When you get the signal to start a race you take off. The ear helped you to react. Sight, hearing, feeling, smell and taste are called the special senses.

### Fig 9.1 - The manner in which the image is formed on the retina

Fig 9.1 shows how an image is formed in the eye. The optic nerve sends messages to the brain to identify the object and sends out messages to react. Light falls on the object in front and it is reflected in the eye. The image thrown on to the retina is, upside down and smaller than the object. The message carried through the optic nerve to the brain identifies the object properly.
The ear contains receptors sensitive to sound. Vibrations in the air, make the sound enter through the outer ear and vibrate the ear drum. The middle ear is an air filled cavity. Three small bones or ossicles in the middle ear link the ear drum that vibrates and connects a coiled tube, the cochlea with sensory endings in it. Here the sound vibrations are converted to nerve impulses, which travel through the auditory nerve to the brain. When these nerve impulses reach the brain they are interpreted as sound. The quality, pitch and loudness/volume of the sound being determined by the way in which vibrations affect the cochlea. A reflex action damps down any violent oscillations of the ear ossicles produced by loud noises. The brain has the ability to highlight the sound which is important and suppressing or ignoring the others.

Fig 9.3 depicts the structure of the nose.
In the upper part of the nasal cavity are the sensory organs which respond to chemicals in the air and confer a sense of smell. The olfactory organs, sensitive to smell are two small patches of epithelium located in the upper regions of the nasal cavity. Normal breathing air passes below the olfactory organs. In stimulating, air is directed upwards to the sensitive surfaces. Sensitive organs respond to chemical stimulation. Many different odours can be distinguished. The impulses pass via complicated nerve plexuses to the forebrain and cerebral cortex. Thus we are able to distinguish the odour of food, flowers, leaves, fruits, animals, the bad and the good smell.

Taste- The sense of taste is conferred by groups of sensory cells in the tongue that are stimulated by chemicals. The taste buds contain receptors contain both sensory cells and supporting cells embedded in them. Taste buds are found in the soft palate, the epiglottis, the opening of the oesophagus. Only the chemicals soluble in water can affect the taste buds. They are not equally sensitive or responsible for, sweet sour, salt and bitterness. Most taste buds are unevenly distributed over the tongue so some part of the tongue are more sensitive than others to a particular chemical. The impulses are passed off in nerve fibres that pass to the brain. Unlike most sensory organs there is a long interval between the application of the stimulus and appreciation of the sensation. The tongue is also sensitive to cold.

Homeostasis

We must maintain our internal environment for the efficient functioning of cells and blood cells. Internal environment is the environment around cells. Maintaining the composition of the environment around the cells uniformly is called homeostatis.

The normal temperature of the human body is 37 °C or 98.4 °F
Man by both voluntary and involuntary means is able to maintain a constant internal temperature even in extremes of heat or cold and feel very independent of his surroundings because the internal body temperature is kept constant and does not alter with fluctuations in external temperature. Chemical changes in glands and in contracting muscles produce a great deal of heat. 95% of the energy transferred in chemical reactions in the body appears as heat. The circulatory system distributes this heat around the body and temperature rises, which makes you comprehend that the circulatory system is distributing this heat. When you warm up before a strenuous sport, it makes the whole body ready for efficiency which would prevent any injury in the body. Vigorous exercise can produce a rise of temperature from 1-4 °C.

Why do you fan your self when you feel hot? Why do you shiver when you are in cold areas like Nuwara Eliya?

**Shivering**

This takes place when the body temperature begins to drop. It is the contractions of the muscles that make you shiver. These muscle contractions produce heat which helps to raise the body temperature. A comfortable environment is one which results in a body temperature of about 33°C.

**Sweating**

External conditions vary between 25°C and 29°C. Above this range sweating begins and below 25°C shivering sets in nerve impulses to stimulate the sweat glands into activity, a layer of moisture is produced on the skin surface. As the sweat evaporates off it takes latent heat from the body and so reduces the body temperature. Sweating from the palm, armpits, soles seem more dependent on emotional stress where as evaporation from the forehead, upper lip, neck, chest and trunk is responsible for temperature regulation.

**Control of glucose**

The body receives energy by the combustion of glucose. The Carbohydrates converted to sugar. After a meal the blood sugar level rises, but comes back to normal. This process is controlled by the hormone insulin. Lack of sufficient insulin in the blood stream increases the content of blood sugar which leads a person to a disease called diabetes. Glycogen, insulin and adrenaline control the level of glucose in the blood.
Immunity

Our body has the ability to combat diseases. This is called immunity. The natural immunity is due to the presence of white cells in the blood which has the ability to destroy bacteria. They can ingest and destroy bacteria, make antibodies. Some diseases form antibodies in the blood, that makes the person immune to that particular disease. Such diseases are measles, chicken pox, mumps, etc. By injecting weakened or killed viruses, artificial immunity is created in the system.

Eg:- Polio, measles, whooping cough

Hormones

Hormones are chemicals that affect the rate of the vital processes of the body. From the glands that make them, they are carried by blood plasma all around the body. Each hormone has one or more target organs and affects the rate at which the organ works. The illustrations show the main glands that secrete hormones. Study the grid below to understand the role played in the human body by these ductless glands that secrete hormones.
<table>
<thead>
<tr>
<th>Gland</th>
<th>Position</th>
<th>Name of Chemical</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pituitary</td>
<td>Head</td>
<td>Growth hormone</td>
<td>Controls the amount of water reabsorbed into the blood by the kidneys. Influences the growth of bones and tissue. It is sometimes called the master gland because it regulates the activities of other endocrine glands. Stimulates the activities of other endocrine glands. Stimulates the secretion of adrenaline.</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Neck (front of the windpipe)</td>
<td>Thyroxin</td>
<td>Controls the rate of growth and development in adults. Controls chemical activity particularly respiration. Deiciency during infancy causes mental deficiency called cretinism which can be cured in the early stages, by administering thyroxine.</td>
</tr>
<tr>
<td>Parathyroid</td>
<td>Back of the thyroid</td>
<td></td>
<td>Controls the concentration of calcium in the blood.</td>
</tr>
<tr>
<td>Adrenal</td>
<td>above the kidneys</td>
<td>Cortisone adrenaline</td>
<td>Accelerates the conversion of protein to glucose. Quickens the heartbeat in danger. Diverts blood from the alimentary canal and the skin to the muscles. Speeds up the rate of breathing and conversion of glycogen to glucose. For vigorous activity in running away or putting up a fight or another vigorous action.</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Below the stomach</td>
<td>Insulin Glycogen</td>
<td>Controls use of sugar in the body. Increase the rate of conversion of glucose to glycogen, glucose together with adrenaline.</td>
</tr>
<tr>
<td>Ovary</td>
<td>reproductive organs</td>
<td>Oestrogen</td>
<td>Controls the development of the secondary sexual characteristics at puberty. Causes the lining of uterus to thicken. Promotes the development of the female secondary sexual characteristics.</td>
</tr>
</tbody>
</table>
By now you would have realized what a wonderful body you possess. For efficient functioning, you have to look after your body providing the necessary nutrients, rest and exercise. You should understand that the harmonious function of the systems will make you healthy and fit. Find out what you can do to protect the sensory organs.

Fill the grid below:

<table>
<thead>
<tr>
<th>Sensory organ</th>
<th>Your responsibility to protect it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye</td>
<td></td>
</tr>
<tr>
<td>Ear</td>
<td></td>
</tr>
<tr>
<td>Nose</td>
<td></td>
</tr>
<tr>
<td>Skin</td>
<td></td>
</tr>
<tr>
<td>Tongue</td>
<td></td>
</tr>
</tbody>
</table>

Check whether you have adopted the following precautionary methods.

- Protect the eye from foreign bodies.
- Never try medicine without consulting a doctor.
- Check the eye sight and use spectacles if necessary.
- Never expose the eyes to bright lights.
- Watch television away from it. If its 14” screen be 14’ feet away.
- Clean ears and never put anything inside.
- Clean nose and never take too hot food or drink to damage the taste buds. and the mucus membrane in the mouth.
Let our skin glow

You are now a little conscious about looks, appearance, attire. Whatever your complexion be if you maintain a flawless skin you will look attractive. Do you know that your skin is the largest organ in the body.

You should study this organ to comprehend the value of protecting it because a glowing skin is a sign of a healthy body. You and your friends does not have the same skin colour. Have you ever thought why the colour differ. It is because of the pigment called melanin under the skin. Depending on the thickness of the pigment the complexion vary. Melanin protects the skin from the ultra-violet rays of the sun.

Important functions of the skin

- Protects the internal organs from external injuries.
- Prevents the entry of organisms.
- Retain the quantity of water in the body.
- Controls the body temperature.
- Sensitive to external environment.
- Forms vitamin D.

The skin is sensitive to
Heat, pain, touch, cold, pressure.

Why do you shiver and get goose bumps (hair on the skin straightens and the pores become prominent) when you feel very cold. Shivering is a natural way of making you warm to combat the effect of cold. It produces heat energy, oxidizing the food in the cells of your muscles. When you are at excessive heat, sweat comes out through the pores of your skin to make the surface cool and also to give out heat.

When something touches your skin you feel it. A simple thing like the name tag of your dress at the back of your neckline is enough to irritate you.

Touch – The encapsulated end organs in the dermis respond to light pressure on the skin. Sense of touch also depends on the free nerve endings wrapped round the hair follicles. Any movement of the hair follicle stimulates the nerve ending.
Heat and cold

There are different receptors that respond to heat and cold. A cold ‘spot’ will not respond to heat.

Pain

Any free nerve ending can produce the sensation of pain. However a pin may elicit a sensation of touch on the area of skin and pain on another. Though we regard pain as inconvenient and stimulating they have biological advantages. They cause us to remove the affected part from danger quickly and automatically.

Look at the illustration of the skin.
The two main parts of the skin are dermis and the epidermis. Sensory nerve cells are in the dermis. All nerve endings are at the dermis and some penetrate the outer tissues of the dermis and possibly into the epidermis.

Though the skin has no depth you may realise how important is this organ. It is your responsibility to protect it and keep it healthy. Nutritious food specially green vegetables, orange and red fruit, vegetables are essential for a clean and clear skin. Similarly keep the skin clean but not too dry or not too oily. Wash with a mild soap. Exercise to provide a good flow of blood. These will help you to maintain a glowing skin.