

**1. List the four ways in which the skin serves as a protective layer for our body.**

**Solution:**

The four ways in which the skin serves as a protective layer for our body are:

- It protects the underlying tissues from mechanical shocks
- It holds the body fluids inside and prevents excessive water loss by evaporation
- Checks the entrance of diseases or harmful substances causing diseases
- Protects the body against excess ultraviolet light that can be harmful

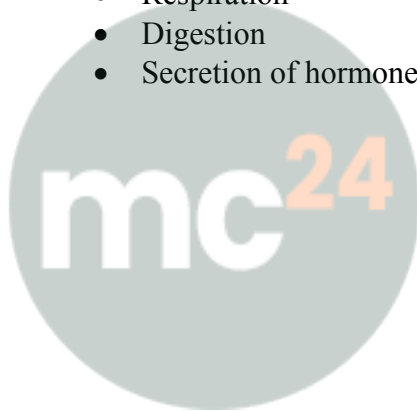
**2. Cross out the items in the following list which are not the functions of the human skin:**

**Sensation, respiration, storage of glycogen, excretion, digestion, temperature regulation, synthesis of vitamin D, secretion of hormone**

**Solution:**

The following are not the functions of the human skin:

- Respiration
- Digestion
- Secretion of hormones



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## Progress Check

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**1. Name the three sub-layers of the epidermis from outer to inner.**

**Solution:**

The three sub-layers of the epidermis from outer to inner are as follows:

- Outermost cornified layer
- Middle granular layer
- Inner malpighian layer

**2. Write True(T) or false(F) for the following statements:**

- Stratum corneum is made of dead cells having keratin**
- The malpighian layer is hard and resistant to bacterial invasion**
- The pigment melanin which imparts colouration to the skin is found in the Malpighian layer.**
- The dermis is very thick on palms and soles.**

**Solution:**

- The statement is true. The stratum corneum of the outermost layer made of several layers of flattened dead cells.
- The statement is false. The cornified layer is a tough layer offering resistance to bacterial infection.
- The statement is true.
- The statement is true.

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Progress Check

1. Match the items in Column I with those in Column II.

	Column I	Column II
(i)	Air spaces	a. Hair
(ii)	Mammary glands	b. Sebaceous glands
(iii)	“Goose-flesh”	c. Rudimentary in males
(iv)	Traces of urea	d. Races of hot countries
(v)	More numerous sweat pores	e. Gray hair
(vi)	Oily secretion	f. Sweat

Solution:

	Column I	Column II
(i)	Air spaces	Gray hair
(ii)	Mammary glands	Rudimentary in males
(iii)	“Goose-flesh”	Hair
(iv)	Traces of urea	Sweat
(v)	More numerous sweat pores	Races of hot countries
(vi)	Oily secretion	Sebaceous glands

2. How do hairs provide the sensation of touch?

Solution:

Hair provide the sensation of touch as the nerve fibers extend up to their bases.

3. How is the outer surface of the skin made waterproof?

Solution:

The outer surface of the skin is made waterproof due to the presence of sebaceous glands which secrete oil known as sebum to keep the epidermis supple and to prevent water loss by evaporation.

Progress Check

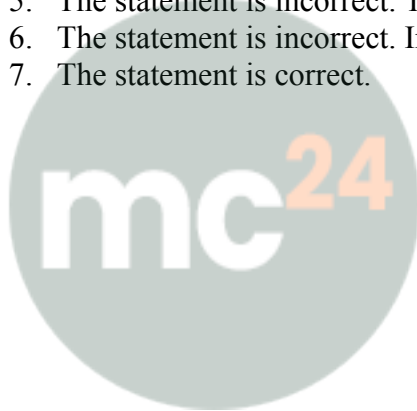
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The statements given below have some parts printed in bold face. In case these parts are incorrect, rewrite these in correct form.

1. All mammals are **ectothermal**.
2. Hibernation is also known as **summersleep**.
3. Human body temperature normally is **98.6°F**(37°C)
4. Vigorous activity on a cold day **overheats** you.
5. The principal heat-regulating centre is located in **thyroid**.
6. Increased body heat causes **vasoconstriction**.
7. **Facial hair** in humans contributes to sex differences.

**Solution:**

1. The statement is incorrect. All mammals are endothermal.
2. The statement is incorrect. Hibernation is also known as winter sleep.
3. The statement is correct.
4. The statement is incorrect. Vigorous activity overheats on a hot day.
5. The statement is incorrect. The principal heat-regulating centre is located in hypothalamus.
6. The statement is incorrect. Increased body heat causes vasodilation.
7. The statement is correct.



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## Review Questions

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### A. Multiple Choice Type

1. If for some reason the sebaceous glands fail to function:
- (a) The body will not be able to regulate the body temperature
  - (b) The skin will turn darker with more melanin
  - (c) The hairs will fail to grow
  - (d) The skin will turn dry and rough

**Solution:**

(d) The skin will turn dry and rough.

Sebaceous glands secrete oil to prevent water loss by evaporation and keep the epidermis supple.

2. Which one of the following pairs include the abnormal conditions of skin pigmentation?
- (a) Leukoderma, Ringworm
  - (b) Albinism, Leukoderma
  - (c) Baldness, Albinism
  - (d) Rickets, Baldness

**Solution:**

(b) Albinism, Leukoderma

Both are abnormal conditions of skin pigmentation.

3. Which one of the organs listed below, functions in regulating our body temperature most actively?
- (a) Heart
  - (b) Lungs
  - (c) Skin
  - (d) Stomach

**Solution:**

(c) Skin

Skin prevents heat loss in cold and promotes heat loss in hot weather.

4. Sweat glands are situated in:
- (a) Epidermis
  - (b) Dermis
  - (c) Both
  - (d) None of the above

**Solution:**

(b) Dermis

Dermis is the inner thick layer of connective tissue and contains other structures such as hair follicles, sense organs, blood vessels etc.

5. The epidermis is highly thickened in:

- (a) Eyelid
- (b) Thigh
- (c) Lip
- (d) Palm

Solution:

- (d) Palm

Epidermis becomes thick and hard as on the palms, soles and even on heels.

**B. Very short answertype**

1. Name the principal body heat regulating centre in our brain.

Solution:

The principal heat-regulating centre is located in hypothalamus.

2. Name any one modified sweat gland and any one modified sebaceous gland.

Solution:

Modified sweat gland – Mammary gland

Modified sebaceous gland – Ceruminous gland

3. Name the skin glands which when inflamed cause acne.

Solution:

The skin glands that get inflamed to cause acne are sebaceous glands due to hormonal imbalance.

**C. Short Answer Type**

1. State any two functions of the mammalian skin other than those concerned with heat regulation.

Solution:

The two functions of the mammalian skin are:

- The primary function of human skin is to provide protection through four different means:
  - Mechanical shocks
  - Prevention of excessive water loss
  - Prevents entry of diseases
  - Protects the body against excess ultraviolet light
- The skin stores reserve food in the form of a layer of fat contained in special cells.

2. What is “goose-flesh”? How is it brought about?

Solution:

Goose flesh is an abnormal roughness of the skin generated by fear or cold wherein the hair follicles turn rigidly upright forming bumps on the skin.

These occur when the erectors contract. Erectors are the obliquely arranged muscles located between the base of the hair follicles and the outer part of the dermis. These smooth muscles are

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required to bring about motion of the hair. When the erector muscles contract, it causes the hair to get pulled vertically thereby depressing the epidermis, causing goose flesh.

### 3. What is the difference between leucoderma and albinism?

**Solution:**

Listed below are the differences:

Leucoderma	Albinism
In leucoderma, skin pigmentation is lost from larger or smaller patches at various regions of the body	Skin loses pigmentation completely all over the body in Albinism.

### 4. Name any two glands found in the human skin. State their functions.

**Solution:**

Two glands found in the human skin are:

Name of the gland	Function
Sebaceous gland	They produce sebum, an oily secretion which makes the hair and the outer surface of the skin oily and waterproof to keep the epidermis supple and to prevent water loss by evaporation
Ceruminous gland	It secretes cerumen which lubricates and protects the delicate eardrum from dust particles and germs.

### 5. An otherwise normal healthy young man started perspiring while it was intensely cold outside. What could have been one reason for it?

**Solution:**

Perspiration can be caused even when it is intensely cold outside when the temperature of the body rises due to strenuous physical activity, fever or any other sickness.

## D. Long Answer Type

### 1. Enumerate in a tabular form the different structures found in the epidermis and dermis of the human skin.

**Solution:**

The different structures found in the epidermis and dermis of the human skin are:

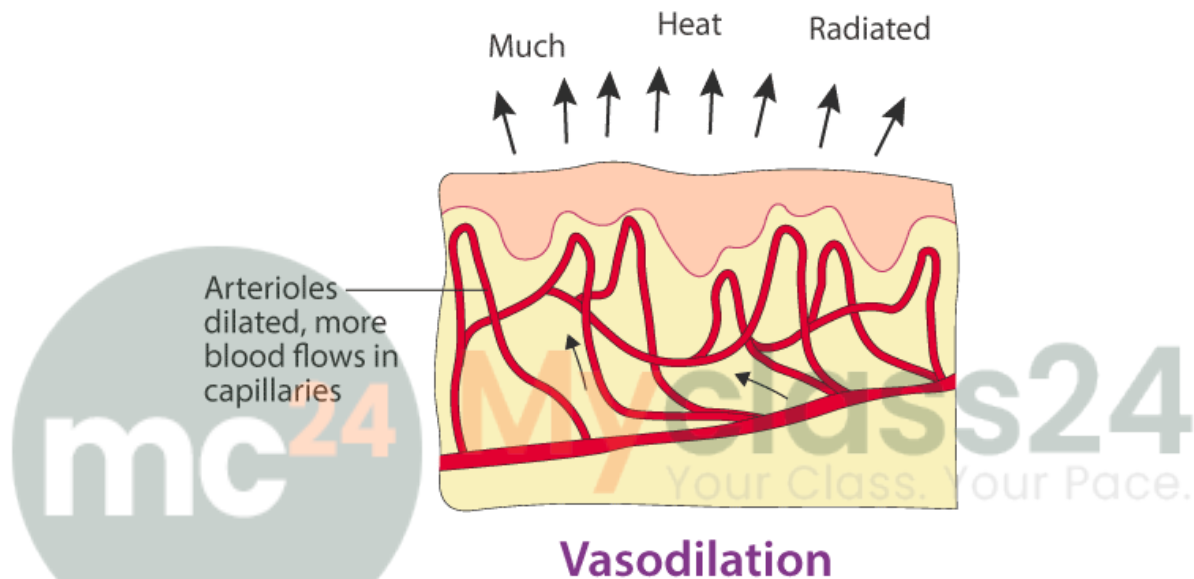
Epidermis	Dermis
Stratum corneum – Outermost layer having flattened dead cells made up of protein keratin.	It is the inner thick layer of connective tissue made of elastic fibers and is tough and flexible. It consists of nerve fibers, blood vessels, sense organs, hair follicles, sweat glands etc.
Granular layer – Thin middle layer having two or three sub layers of flattened cells	

Malpighian layer – Inner most layer of the epidermis where the cells divide actively to generate new cells.	
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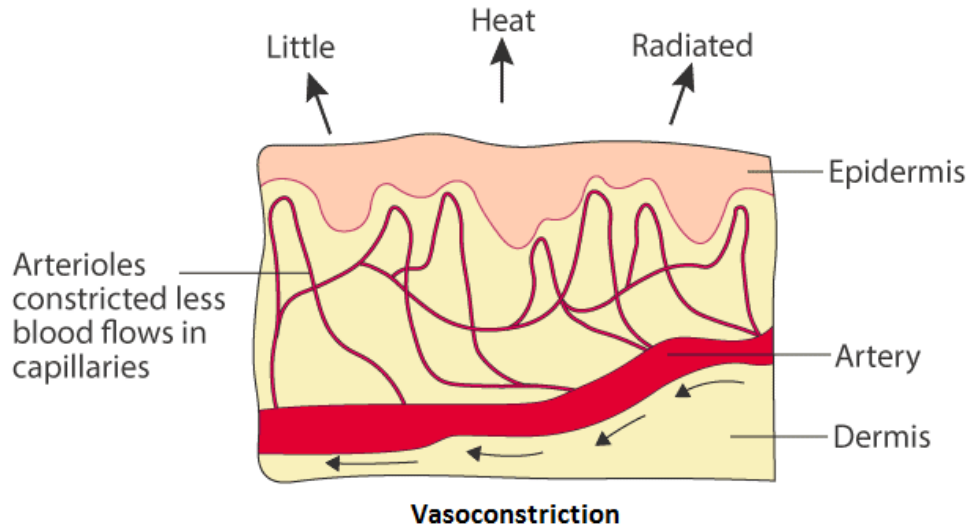
2. Explain the terms “vasodilation” and “vasoconstriction”. How do these processes contribute in the regulation of the body temperature?

**Solution:**

Vasodilation – It is the dilation of blood vessels in the skin that leads to an increase in the blood supply.



Vasoconstriction – It is the narrowing of the blood vessels causing reduction in the blood supply to the skin



Temperature regulation:

In cold weather	In hot weather
The blood vessels are narrowed at lower temperatures reducing blood supply to the skin	Blood supply to the skin is increases at higher temperatures by dilation of blood vessels in the skin
Loss of heat is less by conduction, radiation, convection, vaporization as reduced blood supply lowers the secretion of sweat by sweat glands	Loss of heat is high by conduction, convection and radiation and vaporization as more sweat is produces because of rich blood supply to the skin.

**3. How does our skin provide protection to our body against the following?**

- (a) Entry of germs
- (b) Excessive loss of heat in severe cold
- (c) Entry of harmful ultra-violet rays.

**Solution:**

It provides protection in the following ways:

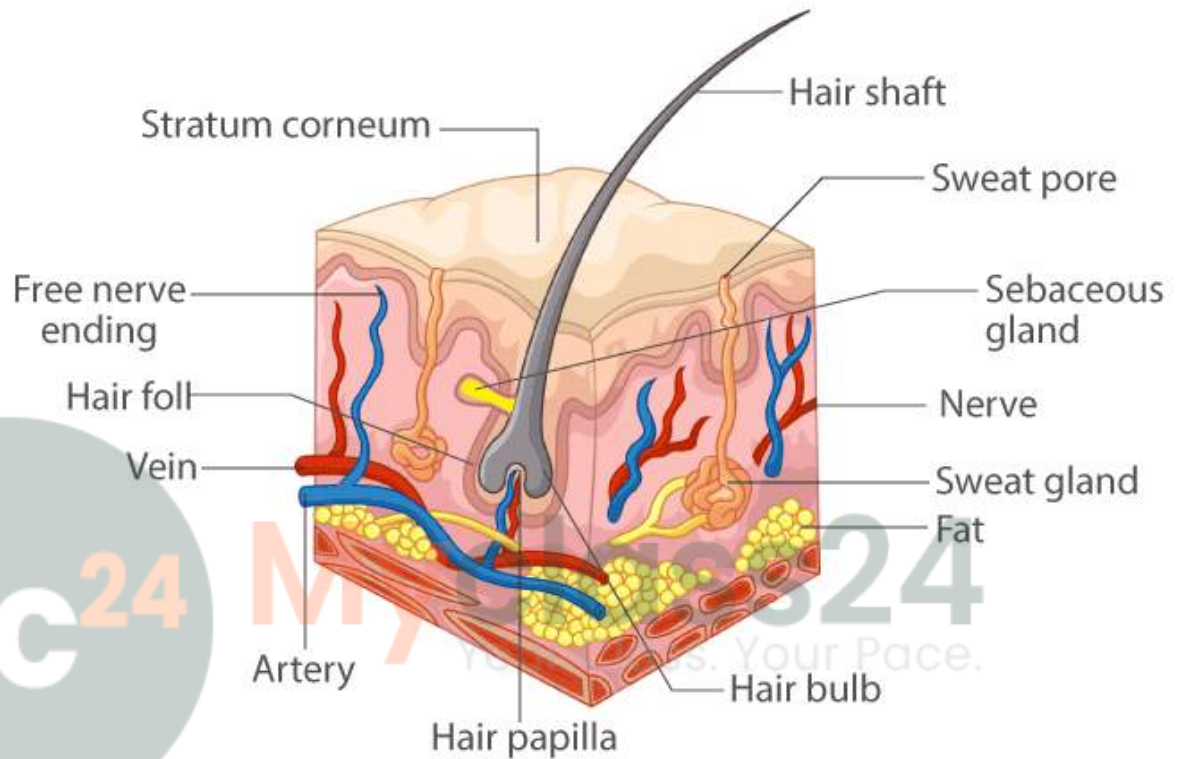
- (a) Entry of germs – The skin checks the entry of toxic substances or the agents causing infection into the body
- (b) Excessive loss of heat in severe cold – The skin prevents the loss of energy from the body. It preserves the body heat at lower temperatures and promotes heat loss in hot weather
- (c) Entry of harmful ultra-violet rays – The skin provides protection against harmful ultra violet radiations.

E. Structured/Application/Skill Type

1. Draw a labeled diagram of the generalized vertical section of the mammalian skin.

Solution:

**HUMAN SKIN**



2. Given below is a diagrammatic sketch of the vertical section of the human skin.

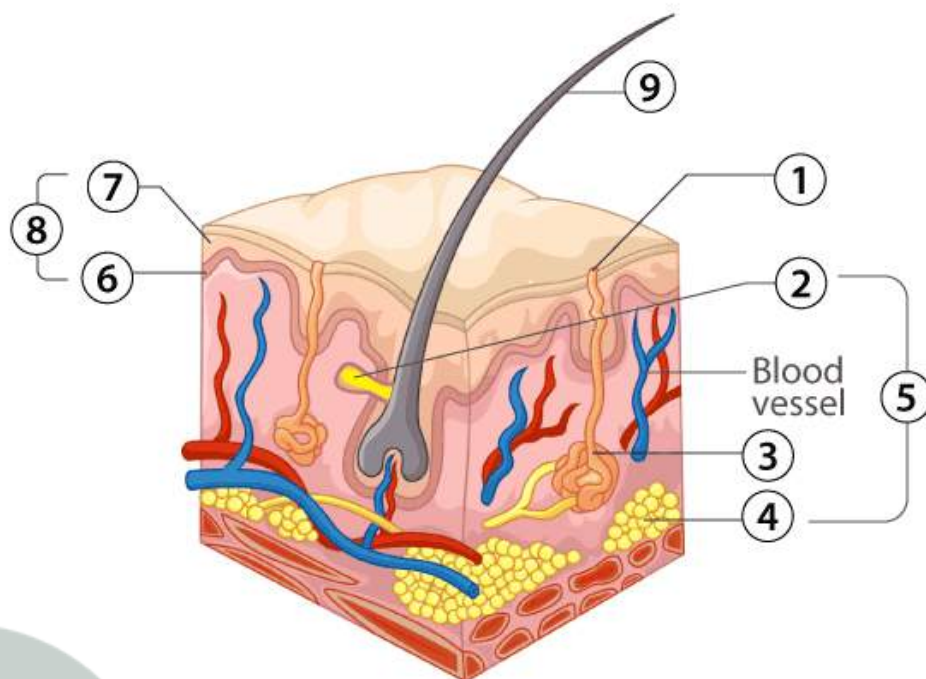
(a) Label the parts numbered from 1 to 9.

(b) State one main function of each of the following parts:

Part 2. \_\_\_\_\_ Part 3. \_\_\_\_\_

Part 4. \_\_\_\_\_ Part 9. \_\_\_\_\_

Name any one of the above parts which has at least three functions.



(c) Part 4 may add to one's good appearance or the "figure". State one example of this function which may be common to both men and women.

**Solution:**

(a) The labels are as follows:

- 1 – Sweat pore
- 2 – Sebaceous gland
- 3 – Sweat gland
- 4 – Fat
- 5 – Dermis
- 6 – Stratum malpighian
- 7 – Stratum corneum
- 8 – Epidermis
- 9 - Hair

(b) Part 2 in the given figure is sebaceous gland. Its main function is to produce sebum to help keep the skin moist.

Part 3 in the given figure is sweat gland. Function of the sweat gland is to secrete sweat - a transparent liquid that is composed of water, salts that are required to regulate body temperature.

Part 4 in the given figure is Fat. The skin stores food in the form of a fat layer

Part 9 in the given figure is hair. Hair provides a touch sensation. It can also be used in the forensic study.

From the above parts, the one which has atleast three functions is:

Sebaceous gland –

- Protects skin
- Produces sebum that lubricates hair and skin of mammals.

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- Sebum also protects from bacterial and fungal infections.
- (c) Part 4 in the given figure is fat. The common function can be that fat preserves act as food reserves and a heat insulating layer. They act as shock absorbers.

