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Q.1 Explain cosmetic as a Quasi drugs & OTC drugs.

→ In Japan cosmetics are regulated by the ministry of health, labour & welfare under the pharmaceutical affairs law.

→ Japan accommodates cosmeceuticals by calling quasi drugs. These are the product that exceed mild actions on the body.

→ There regulation slightly differ, but the difference between cosmetics & Quasi drugs remains ambiguous.

→ The distinction is also influenced by a set of criteria, such as the nature & the Quanti ty of Ingredient used, application method, dosage & appearance of the product.

→ The pharmaceutical affairs law defines quasi-drugs an item for the purpose of.

a. Preventing Nausea & other discomfort
b. Preventing heat rash, soreness etc
c. Encouraging hair growth or removing hair
d. Exterminating & preventing mice, flies, mosquitoes, fleas etc

→ Among the Quasi-drugs are deodorants, depilatories, hair growth treatment, hair-dyes, perm & straightening products and medicated Cosmetic Product.

→ The approval for primary distribution is not always necessary for cosmetics but preapproval is mandatory in case of Quasi drugs.

→ Pre approval is granted by the competent authorities if they judge that the product answered all sanitary requirement.

→ Having an active ingridient approved by the MHLW allows the product to display its effectiveness for a result that has yet to be recognized.

→ This process takes approximately six month for the MHLW to carry out examination.

→ In Japan sunscreens are classified as Quasi drugs. therefore they require approval of their formulation.

→ Product evaluation should be based on ISO 2442 in vivo testing & labelling. Also an SPF of 50+ corresponding to PA++++ is the maximum level allowed on the label.

→ The importation of Quasi-drugs is much more expensive than cosmetics.

* Cosmetics as OTC drugs

→ when producing a cream or lotion if you add an active ingredient or make a drug claim & intended to provide physiological benefit beyond a purely cosmetic effect is called OTC product.

→ There are products that have multiple effects.

– Ex:- Anti-dandruff shampoo is a cosmetic and pharmacological product.

→ other combinations are toothpaste, antiperspirant deodorants, moisteners, sun tan lotions, claiming SPF, medicated shampoo facial creams.

→ Cosmetics drugs & OTC product require FDA premarket approval via new drug application.

→ You will need to assure OTC drug mono graph compliance for more than just your product labelling.

→ Cosmetic products are not subject to the same regulation, efforts, complexity, time, registration & approval as drugs product.

→ As part of the cosmetic drug & OTC products manufacturers will have to report their product's ADR to the FDA.

→ According to the FD&C act cosmetic products do not requir FDA approval before marketing, unless they contains colour additives.

→ Cosmetic-drug combination products are subjected to cosmetic & drug FDA regulation & should comply with OTC & drug - cosmetic labelling requirement.

→ The intended use of a product may be established in several ways such as claims on product labeling or in advertising materials or through the inclusion of ingredients.

→ The FDA has published several OTC categories monographs of non presoription drugs treatment such as acne, dandruff, seborrheic, dermatitis

→ Cosmetic products manufacturer are soley responsible for both ingredients & finished cosmetic products before safety marketing.

→ Ingredient safety can be tested on several animal models using the cosmetic ingredients & monitoring irritation, allergic & toxicity.

→ The facility should be desinged according to GMP standards including proper construction, material & facility design.

→ OTC drug products monographs will include information to be labeled on the product package in arder to assure the product will not be misbranded.

Q.2 Hair growth cycle.

→ Hair growth is a unique & complex process that involves continuous cycles of growth and regeneration, transition & resting phase.

→ The cyclic activity continuous throughtlife but phases of the cycle change with age.

(1) Anagen phase

→ During this phase new hair is produced in the lower part of the hairfollicle.

→ Normally most of the scalp hairs are in their anagen phase at any time, while the remaining 10% is in the telogen or Catagenphase.

→ On the scalp the Anagen phase can last 2-6 year. However in some cases it may be longer (8 year).

→ The longer the Anagen phase, the longer the hair is able to grow.

→ Scalp hair grows at a normal rate of about 1 mm every days. The hair on the arm, legs, eyelashes, & eyebrow shave a much shorter anagen phase & slower growth phase

(2) Catagen phase

→ It is a brief transition phase between the growth and resting phases, which marks the elongation of the growth phase

→ On the scalp, the catagen phase usually last between 2 and 3 weeks during this phase, cell division stops, the follicle tube shrinks & detaches from the dermal papilla.

→ Melanin production stops in this phase, leading to a non-pigmented lower end in the hair.

(3) Telogen phase

→ This is the final phase & lasts until the fully grown hair is shed.

→ Although the telogen phase is called the resting phase. many activities occur during this phase, which allows the hair shaft to be shed & stimulates the conditions essential for regrowth.

→ The hair either shed during the telogen phase or remains in place until the next anagen phase.

→ When the new hair growing inpushes it out on the scalp. the telogen phase usually last for approximately 2-3 months

→ As soon as the telogen phase ends, the hair returns to the first phase & entire cycle begins again.

→ Newhair appears from the same follicle.

→ Removal of telogen hair easy & painless, these are the hair follicles that comes out during shampooing or combing the hair.

Q3 Define, classify & write applications of Preservative.

→ Preservatives are natural or synthetic ingredient added to the product to prevent spoilage, microbial growth, undesirable changes or to extend product's shelf life.

classification

(A) Based on MoA

1) Antioxidants

→ The Agent which prevents oxidation of API which otherwise, undergo degradation due to oxidation as they are sensitive to oxygen

Ex:- Vitamin E, Vitamin C, BHT, BHA

2) Antimicrobial agent

→ The agent which is active against gram +ve & gram -ve micro organism which cause degradation of Preparation.

Ex:- Benzoates, Sodium benzoate, Sorbates

3) Chelating Agent

→ These agents form the complex with pharmaceutical ingredient & prevent the degradation of pharmaceutical formulation.

ex:- EDTA, citric acid.

CB) Classification based on source

1) Natural Preservative:
→ Obtained from Natural source, like Plant, mineral, & animal etc
ex:- lemon, Honey, Neem oil

2) Artificial Preservative
→ Made by chemical synthesis & active against various microorganisms in small concentration.

ex:- Sodium benzoate, sorbates, propionets, nitrites.

Preservative	class	conc. (oral)	conc. (parenteral)	conc. (Rt)
M.P	Amino ester	0.25	0.01–0.5	0.1
E.P	Amino ester	0.1–0.25	0.01–0.5	0.2
P.P	Amino ester	0.5–0.25	0.005–0.02	0.1
B.P	Amino ester	0.1–0.4	0.015	0.1

Application of Preservatives

1) Preservative in food
→ preservatives are added to fight spoilage caused by bacteria, molds, fungus, & yeast.

→ food Preservative also are used to slow or prevent changes in color, flavor or texture & delay rancidity

→ The antimicrobial activity of ascorbic acid is effective against yeasts, fungi & bacteria weakes.

→ The additive can be used in many food products, namely in beverages, pastries, and partially cooked bakery, cheeses, fruits and vegetables pickled or candied, olives, Jam & Jellies, nuts, margarine, meat products, sauces, etc.

→ Benzoic acid is used often in combination with other preservatives, especially in acidic foods due to its strong dependence of pH.

→ Benzoic acid & benzoates are used in flavored soft drinks, non alcoholic beer, frit & vegetables picked or candied, marmalade, Jams & Jellies, confectionary products based on fish & eggs.

2.) Preservative in medicine & pharmaceuticals

→ Boric acid is used as antiseptic, insecticide & flame retardant. It is used as antiseptic & preservative in various pharmaceutical preparations.

→ Methyl paraben is used in cosmetic preparations containing vegetable & animal fat & oil that succeptible to decomposition.

→ Ascorbic acid is used as an anticaidant in aqueous pharmaceutical formulations at a concentration of 0.01-0.1% w/v.

→ Ascorbic acid has also proven useful as a stabilizing agent in mixed micelles containing tetrazepam.

→ Sodium benzoate primarily as an antimicrobial preservative in cosmetic, foods, & pharmaceuticals.

→ Sodium benzoate orally → 0.02-0.5%
Parentical → 0.5%
Cosmetic → 0.1-0.5%

→ It is effectiveness is limited over a narrow pH range.

→ Sodium benzoate has also been used as a tablet lubricant at 2-5% w/w concentration.

→ Sodium sulfite is used in cosmetic, food products & pharmaceuticals.

3.) Preservatives in cosmetic & personal care products.

→ Cosmetic products become easily contaminated by microbes, Containing water, oils, pept

& Carbohydrates cosmetics are a very good source of medium for growth of microbes.

→ All preservative have antimicrobial properties preventing personal care & make up products effectively from spoiling & prolonging substantially the shelf-life.

→ Preservatives in Cosmetics & personal care products help to prevent contamination & the growth of harmful bacterial in products ranging from sunscreens, lotions & shampoos to cleansers, toothpaste, lipsticks & creams.

→ In Cosmetics methyl paraben is the most frequently used antimicrobial preservative.

→ The parabens are effective over a wide pH range and have abroad spectrum of antimicrobial activity although they are most effective against yeast & molds.

4) Preservatives in wood

→ Wood treated with preservatives can be used to build telephone poles, road signs and marine pilling as well as decks, play structures & raised garden beds.

Q4 Define & classify & application of rheology modifier.

→ Rheology modifiers are often referred to as thickners, & Polymeric rheology modifier can be added to formulation to control the rheology & required effect can be achieved with low concentration of the polymer.

→ A rheology modifier is a material that alters the rheology of fluid composition to which it is added.

↓ classification

→ water soluble polymers are classified as follow

A- organic

1. Natural polymer

(i) vegetable

ex:- Guar gum, locast bean gum, gum arabic, pectin, starch, carriageenan.

(ii) Microbial

ex:- hyaluronic acid, xanthan, dextran

(iii) Animal

ex:- Gelatin, Casein, Albumin, Collagen

2. Semi Synthetic

i) Cellulose :- MC, EC, HC, HPMC, CMC, MHPC

ii) Starch :- soluble starch, Carboxymethyl starch, methyl starch

(iii) Alginate :- propylene glycolmester alginates,

(iv) other mucopolysaccharide drt.

3. Synthetic polymers

i) vinyls :- polyvinyl alcohol, polyvinyl pyrrolidone, polyvinylmethyl ether, Carboxyvinyl polymers, sodium polyacrylate.

ii) Ethers :- polyethylene oxide, ethylene oxide-propylene oxide copolymers.

B. Inorganic :- Bentonite, laponite, silicate powder, colloidal alumina.

Applications

→ Thickening agents are often integrated as a food additives & as a cosmetics & personal hygiene product ingredients.

→ Some thickening agent are gelling agents

forming a gel dissolving in liquid phase as a colloidal mixture that forms a weakly cohesive internal structure.

→ Thickening Agent also be used when a medical condition such as dysphagia causes difficulty in swallowing.

→ Some thickening agents may also play a vital role in reducing risk of aspiration for dysphagia patient.

→ Also used to maintain the stability of an emulsion. Some emollient such as petroleum jelly & various waxes may also function as thickening agent in an emulsion.

→ Thickener increases the viscosity of the formulation. pigment have to be uniformly suspended in the emulsion & should not sediment over time.

→ A shampoo with a viscosity similar to that of water would not be favourable as it would run off the hands & not stay on the scalp, but run into the eye instead.

→ Also used in cosmetic or personal hygiene product include viscous liquids such as polyethylene glycol, synthetic polymers, such as Carbomers & vegetal gums.

for example:- for acidic foods arrowroot is a better choice than cornstarch, which loses thickening potency in acidic mixtures.

→ At acidic pH guar gum has sharply reduced aqueous solubility, thus also reducing its thickening capability.

→ Thickening agent otherwise known as texturizing agent, play an important role in the skin feel of emulsions.

→ Examples for thickeners commonly used in skin moisturizing products include hydrophilic ingredients, such as, Xanthan gum, cellulose derivatives, & acylic polymers among others as well as liposoluble ingredient such as waxes, & many emollients used may also have additional thickening properties.

→ Certain nonionic emulsifiers may also have additional thickening effects. Even in o/w creams thickeners are used for viscosity control. The viscosity of a cream is primary determined by the thickener used & the viscosity of the external phase.

Q5 Material used in moisturizing cream.

→ A good moisturizing formulation is now irritant, easy to spread over the skin, easy to rub in without soaping up able to leave the skin feeling soft rather than sticky & pleasantly perfumed.

→ Moisturizing the skin has been viewed throught history as a compliment to beauty & hygiene.

→ The purpose of applying different lipids oils, waxes and butters and animals fats on the facial skin & overall body was primarily to protect the skin from weather.

Ideal characteristics of moisturizer

→ plesant odour & colour
→ Easy to spread & a plesant feeling
→ Non-oily
→ Non-comedogenic
→ Smoothness & softenes the skin
→ Dermatologically safety
→ provides effective hydration
→ Reduce dryness,
→ Improve dull appearance
→ protection against Uv light.

→ (1) Humectant
(2) Emollient
(3) occlusives
(4) skin preservatives
(5) Ceramides

a) Humectants

→ Humectants are hygroscopic ingredients that can increase the water content of the top layer of the skin by enhancing water absorption from the dermis into the dermis

→ The key functionality of humectant is to form hydrogen bonds with molecules of water.

→ Examples:- Glycerin, AHAs, pyrrolidone carboxylic acid; propylene glycol, urea, hyaluronic acid & sorbitol.

→ Glycerin is very common, & effective moisturizer. It reduces dryness & enhanes the cohesiveness of intercellular lipids.

b) Emollients

→ Generally used to plasticize, soften & smooth the skin usually by filling in the void spaces between the corneocytes & replacing the lost lipids in the SC.

→ Emollients can also provide protection & lubrication on the skin's surface to minimize chafing & enhance the skin's aesthetic smoothness & softness.

→ Ex:- Hydrocarbon such as mineral oil & petrolatum & their derivative fatty acids such as stearic acid, linoleic acid & lauric acid & their duct such as alcohol & esters, vegetable oil, such as almond oil; synthetic triglycerides, silicon waxes such as beeswax, Carnauba wax, etc.

c) occulsive

→ water attracting Nature.

→ As they prevent water evaporation from the skin, they can be particularly effective in the treatment of dry skin, which is already damaged.

→ They may have additional emollient effect occulsive are not the appealing ingredient to most Consumer since they are sticky, not easy to remove & may leave the skin with a greasy feeling.

→ The most commonly used ingredient is petrolatum. In addition to forming an impermeable layer on the skin, it

can penetrate into the skin's upper layers and initiate the production of intercellular lipids.

→ Lanolin was very popular in the past. however its use diminished as it is a known irritant ingredient & has an unpleasant odour.

d) Skin rejuvenators

→ This is the newest class among moisturizer ingredients. This category includes protein, primarily skin proteins, such as keratin, elastin & collagen.

→ protein may provide temporary relief from dry skin by filling in the irregularities in the sc

→ It is also known as enhancers of the skin barrier.

e) Ceramides

→ Ceramides can be naturally found in the sc. They are the most important structural elements of the intercellular lipids, which are necessary to link the protein rich corneocytes into a waterproof barrier. that is capable of protecting the underlying skin tissues.

→ They function to help maintain the integrity of the skin barrier.

→ It has been shown that ceramides applied externally in the form of moisturizer can be effectively reduce dry skin symptoms.

→ These lipid molecules have been used increasingly in recent years in the treatment of dry skin and in Cosmeceuticals.

6 write about surfactant add a note on its application

→ Surfactant can be grouped by charge characteristics of their polar head group. The four group includes

(A) Anionic surfactants
→ good foaming property & principle surfactant
→ used in shampoo

(i) Alkyl sulphates
→ combination of two compounds (Lauryl sulphate, myristyl sulphate). is widely used.

(ii) Alkyl polyethylene glycol sulphate
→ good cleansing as well as good foaming property.

(iii) Alkyl benzene sulphonates
→ Most widely used in washing powder but not in cosmetic due to excessive washing

(iv) O-olefin sulphate
– It is an alkyl sulphonate by sulfonation of linear olefins. excellent foaming property.

– It is stable at both pH acidic & basic & widely used to prepare low pH shampoo.

→ It has low cloud point hence also used to prepare clear liquid shampoo.

B) Non ionic surfactant

→ Secondary surfactant

→ Not used to produce foam but used as foam boosters, viscosity inducer, emulsion stabilizers and opacifier.

(i) poly alkoxylated derivatives

→ These are ethoxylated alcohol and phenols, blockpolymers, sorbital ester & polyglyceryl ethers.

→ They have stabilizing, emulsifying, pearlescent & foaming property, also impart good rinsing property.

(ii) fatty Acid alkanolamides

→ These include monoalkanomides & diethanolamides etc.

→ solubilising agent :- Lauric monoethanolamide

→ viscosity inducing Agent :- Lauric monoethanolamide

→ pearlescent Agent :- Stearic ethanolamide

→ Softening agent :- oleic ethanolamide.

→ foam booster

(iv) Amine oxides

→ These compound possess strong polar linkage between nitrogen and oxygen hence they are also called as polar non-ionic surfactant

→ They constitutes major group of synthetic surfactant.

→ They are added as secondary surfactant because of their conditioning, damboosting & antistatic property.

C) Cationic Surfactant

→ used as both principle & secondary surfactants.

→ These surfactants are used in low concentration because they are toxic to eye.

→ Apart from the above they also have good foaming & partly cleaning properties.

i) Alkylamines

→ Major group of Cationic surfactant

⇒ used in combination with hydrophilic surfactant in order to provide conditioning and anti-static property to the shampoo.

ii) Ethoxylated amines

→ These are nitrogen containing surfactant which are obtained by ethoxylation of long chain alkylamine.

→ Some times also used as foamboosters.

(iii) Alkyl-Betains

⇒ These classes of Cationic surfactants obtained from Ndimethyl Glycine.

→ They have following properties.

→ Enhance the efficiency of foam
→ Good stability
→ Have Viscosity inducing agents
→ Non-irritant to skin & eye.
→ Contain conditioning & anti-static property

(3) Amphoteric surfactants
→ both property cationic & Anionic.

→ They form zwitterions when the pH. of media is neutral. They have excellent hair conditioning property & hence used as secondary surfactants.

→ Examples of amphoteric surfactant are
(i) Dialkyl Ethylene diamines
(ii) N-alkyl Amino acids.

Applications of surfactant

1) Detergency
→ one of the most common applications of surfactant in cosmetics is for cleansing formulation.

→ They remain on hair & skin via vander waals force.

→ Surfactant in detergents helps to get rid of these oily deposits. The lipophilic ends of

the molecules are attracted to & align with the lipids on the skin surface of their hair & skin.

→ Meanwhile, the hydrophobic ends of the molecules align toward the surface of these deposits, thereby increasing the hydrophiliaty.

→ That allows the lipid deposits to lift off the surface of skin or hair where the rinse water washes them away.

2. Wetting

→ Surfactant are also acts as wetting agents & this property allows surfactants to spread more easily on the surface & inject themselves between the oily deposit & the skin or hair surface.

→ This lifts up the oil & allows it to be removed. wetting also makes the product easier to spread & prevents it from balling on the surface.

→ This is useful in Cosmetic cream & lotions

3. foam

→ foam is an important characteristics of cleansing cosmetics. It is formed when air is dispersed in a continuous liquid medium.

→ The air bubbles are surrounded by thin layers of liquid & the surfactant helps stabilize the bubble that are formed creating foam.

→ surfactant also have a slightly different role in a mouthrinse in that they are necessary to solubilize the flavour oils & give stability to the mouthrinse in that they are necessary to solubilize the flavour oils & give stability.

4. Thickening

→ The thickness of a surfactant solution depends on how closely the micelles pack together.

→ Since cleaning products are typically made from charged surfactants the outer surfaces of the micelles have a specific charge density that causes them to repel other micelles.

→ When the surface charge density is lowered by adding salt for example the particles pack together more closely, & the solution thickne

5. Emulsification

→ Another major application of surfactant to cosmetic is in the creations of semi-stable mixture of oil & water or emulsions.

→ They can be simple oil-in-water or water-in-oil or more complex multiple emulsions.

→ Each type has benefits that make it ideal for certain cosmetic applications. Nearly all creams & lotions are created using surfactant.

Q. 7 Structure & functions of the skin.

+ structure of skin

→ The skin is the largest organ of the body making up to 16% of body weight, with a surface area of 1.8 m².

→ There are three structural layers to skin epidermis, the dermis & subcutis.

→ Hair, Nails, Sebaceous, sweat & apocrine glands are regarded as the derivatives of skin.

→ The epidermis is the outer layer, serving as the physical & chemical barrier between the interior body & exterior environment.

+ Epidermis

→ Epidermis is stratified squamous epithelium. The main cells of the epidermis are keratinocytes, which synthesis the protein keratin.

→ The four separate layers of the epidermis are formed by differing stages of keratin maturation.

→ The Epidermis varies in thickness from

0.05mm on the eyelids to 0.6 ± 1.5 mm on the soles of the feet & palms of the hand.

→ four layers of epidermis are
- Stratum basale
- Stratum spinosum
- Stratum granulosum
- Stratum Corneum

→ In addition the stratum lucidum is a thin layer of transparent cells seen in thick epidermis.

• Stratum Basale

→ Innermost layer of the epidermis which lies adjacent to the dermis comprises mainly dividing & non-dividing keratinocytes divide & differentiate. they move from this deeper layer to the surface.

• Stratum Spinosum

→ As basal cells reproduce & mature, they move towards outer layer of skin, initially forming the stratum spinosum.

→ Intercellular bridges, the desmosomes which appear as prickles at a microscopic level, connect the cells.

• Stratum Granulosum

→ Continuing their transition to the surface the cells continue to flatten, lose their nuclei and their cytoplasm appears granular at this level.

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Stoicatrim corneum

→ The final outcome of keratinocyte maturation is found in the stoicatum corneum, which is made up of layers of hexagonal shapped, non viable cornified cells known as corneocytes.

Dermis

→ The dermis varies in thickness ranging from 0.6 mm on the eyelids to 3 mm on the back palms & soles.

→ Two layers comprise the dermis
A. Thin papillary layer
A. Thicker reticular layer

→ The Dermis is made up of fibroblast, which produce collagen, elastin and stoicatum proteoglycanes, together with immune competent mast cells & macrophages.

→ collagen fibres make up 70% the dermis, giving it strength & toughness. Elastin maintains normal elasticity & flexibility while peptidoglycan provides elasticity.

Subcutis

→ This is made up of loose connective tissue & fat which can be up to 3 cm thickon than abdomen.

→ It protects body from external trauma & insulates from cold. It acts as a main storage site for fat & therefore energy.

→ There are many blood & lymphatic vessels & nerves passing through subcutis.

→ The dermis receives a rich blood supply. A superficial artery plexus is formed at the papillary & reticular dermal boundary by branches of the subcutis artery.

Nerve supply

→ The skin has rich innervation with the hand, face & genitalia having the highest density of nerves.

→ All Cutaneous nerves have their cell bodies in the dorsal root ganglia and both myelinated & non myelinated fibres are found.

functions of skin

1. Protection from wear & tear
2. protection Against infections & chemicals
3. protection Against Uv rays
4. Maintaining body temperature
5. response to increased temperature

6. Response to fall in temperature
7. receiving stimuli from the outside world.
8. Absorption & excretion
9. Nutrient & water storage
10. Communication.

1) protection from wear & tear

→ The skin varies in thickness according to the amount of friction & pressure to which it is subjected on the eyelids it is about 1mm thick, while on the palms of the hands & soles of the feet it can be up to 1 cm.

→ There is little or none where the skin is not subject to friction and more where the skin is subjected to constant external pressure.

→ Subcutaneous fat beneath the skin acts as a shock absorber & helps to protect the body from Trauma.

2) protection against infections & chemicals

→ Trauma to the skin creates an opportunity for invasion by micro organisms & results in an inflammatory response by redness, swelling, localised heat, pain & pyrexia.

→ Blood flow increases & transports white

blood cells & macrophages to the site of injury to fight infection & repair the tissue.

3. Protection against UV rays

→ The skin protects the body from harmful UV rays. The pigment melanin is produced in special cells called melanocytes which are found at the base of the epidermis.

→ The skin then turns brown as melanin is produced. Melanin absorbs UV light & prevents it damaging cellular DNA. Hair made of keratin also helps to protect people from UV light as well as from extremes of temperature & trauma.

4. Maintaining body temperature

→ The body can survive environmental changes in temperature ranging from -52°C to +49°C.

→ Maintaining a constant core body temperature 37°C is an important function of the skin & this regulation is essential for the normal functioning of cellular enzymes throughout the body.

5. Response to increased temperature

→ Arteries & veins in the subcutaneous layer immediately beneath the dermis are linked to small arterioles & capillaries which supply blood to the dermis. Blood

flow to the skin can vary from about 250 ml/min to 3l/min in response to the need to lose or conserve heat.

→ Heat is lost from the body in four ways.

Convection:- Heat is lost to air currents for example, when a fan is used to cool a patient

Conduction:- Heat is lost to cooler solid objects which are in direct contact with the skin.

Radiation:- Heat from a warm body is lost to the cooler surrounding air

Evaporation:- Heat is lost as a liquid becomes a gas. for example through evaporation of sweat.

→ There are 400/cm^2 on the palms & soles of the feet & only 70 cm^2 on the back.

→ These glands have their own nerve & blood supply & produce sweat when the skin temperature rises above 35°c.

→ Sweat is composed of 99 percent water with sodium urea, lactic acid & potassium making up the remaining one percent.