Subj	e	ct:
Hair	ୡ	Beauty

UCO91 Anatomy, physiology and cosmetic science

LO1: Understand the role of cosmetic ingredients.

Common	cosmetic	ingredients
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- Phthlates plasticisers that help products stick to your skin.
- **Parabens** preservatives used to keep products free from most micro-organisms. **Titanium Dioxide** – pigment which is also a UV filter.
- Formaldehyde preservative which prolongs shelf life and prevent bacterial contamination, usually used in nail products.
- **UV filters** provide protection from UV light by blocking or absorbing harmful rays. **Glycerine** – softening, hydrating properties on the skin and hair.
- **Hydrogen peroxide** an oxidation agent which is mixed with hair tint to develop colours. **Pigments** - add colour to a variety of products including foundation (iron oxide) and mica (eye shadows).
- Lanolin emulsifier, emollient and occlusive moisturiser to enhance natural moisture in the hair and skin.
- Squalene emmolient which helps to prevent moisture loss in the skin and improve elasticity. Urea – humectant which helps exfoliate dead skin build-up.
- Collagen increases skin durability to improve skin elasticity.
- **Oils** Emollients which acts as binders for other ingredients and soften and lubricate skin and add gloss to hair.
- **Dimethicone** type of silicone which is an emollient and antifoaming agent, smooths surfaces. **Vitamin E** – fat-soluble essential vitamin with anti-ageing, anti-inflammatory and anti-oxidant properties.
- Alpha hydroxy acids used as chemical exfoliation, strengthens the skin barrier and draws hydration to the skin.
- Beta hydroxy acid oil-soluble and penetrates deep into the skin.
- **Fragrances** can be essential oils, fruits, natural or synthetic to make products more appealing.
- **Dihydroxyactone** a colour additive used in sunless tanning products to darken the skin reacting with amino acids.
- Aloe Vera and other plant extracts rich antioxidant with anti-bacterial and antiinflammatory properties.

A01	AO2	AO3	A04	AO5
Demonstrate knowledge and understanding	Apply knowledge and understanding	Analyse and evaluate knowledge and understanding	Demonstrate and apply relevant skills and techniques	Evaluate and draw conclusions to inform development

The function of common ingredients:

- **Preservatives** used to keep products free from microorganisms and help prolong the shelf life of the product.
- **Antioxidants** prevent degradation of products from exposure to oxygen and prevent fats from spoiling.
- Soothing agents improve signs of sensitivity
- **Stimulating** helps boost blood circulation and removes impurities.
- Antiseptic used to inhibit the growth of microorganisms.
- **Astringent** water-based solution which shrinks or constricts the skin.
- Abrasives used in the process of removing dry, dull dead skin cells.
- Bulking agents increase the viscosity of a liquid. Protecting agents – protect the hair and skin from harm such as UV filters.
- Foaming agents used to help produce lather and reduce surface tension.
- Humectants attracts moisture to hydrate the skin.
 Emulsifier added to oil and water emulsions to keep
 them stable.
- **Emollients** soften and smooth the skin and hair and reduce water loss.
- Oxidising agents used in colouring, lightening and neutralising products.
- **Stabilisers** control the PH levels, hold emulsions together.

The safety of cosmetic ingredients:

Some ingredients are classed as prohibited and restricted in the UK:

Hydroquinone – linked to cancer, organ-system toxicity and respiratory tract infection.

Hydrogen peroxide - only low doses (12%) are allowed. High doses

cause skin and pulmonary irritation, skin blanching.

Benzyl salicylate – causes sensitive skin and more prone to UV exposure.

Citronellol – can develop allergies, rashes, redness, itchiness and more prone to UV exposure.

Ingredients that are classed as toxic in the UK include:

Formaldehyde – linked to cancer and allergic skin reactions. Parabens – disrupts the endocrine system and creates hormonal imbalances. Linked to increased risk of breast cancer and reproductive toxicity.

Phthalates - disrupts the endocrine system to cause fertility issues.
Over exposure linked to asthma, breast cancer, obesity, type II diabetes, neurodevelopmental and behavioural issues.
Triclosan - disrupts the endocrine system and can cause toxin accumulation. Increased chance of developing allergies and eczema.
Coal tar - known carcinogen. Can slow skin cell growth.

The effects of dangerous and toxic cosmetic ingredients:

irritated skin, rashes, redness on the skin, difficulty breathing, acne, bitterness on the tongue, allergies, UV sensitivity, internal organ damage, autoimmune disease, hormonal imbalances, reproductive problems, carcinogenic.

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Anatomy,	physiology	and	cosmetic	science

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LO1: Understand the role of cosmetic ingredients.

Cosmetic ingredients derived from animal products: As a society we are much more aware of our environment and the world we live in. More people are looking for alternatives to products derived from animals and that will help sustain the environment. **Natural products** - a product can be described as natural if it has just 1% naturally sourced, plant based or mineral ingredients. **Vegan products** - do not contain any animal extracts or by-products in the ingredients or manufacturing process, including never being tested on animals.

Ingredients derived from animal products:

Retinol – derivative of Vitamin A, a water-soluble protein from animal collagen. Helps with skin elasticity, reduces wrinkles, treats hyperpigmentation.

Gelatin - water-soluble thickening and gelling agents containing high levels of protein from animal collagen.

Lanolin - derived from sebaceous glands of sheep. Lubricates the skins and locks in moisture.

Hyaluronic acid – produced from the combs of rooster. Increases and maintains the moisture content of the skin. Keratin – derived from feathers, horns and wool of different animals. Helps to control and soften wrinkles, is found naturally in our own hair, skin and nails.

Reasons why animals are used for testing cosmetic ingredients: The Medical field has tested on animals for a long time, practising surgical procedures and testing medicines and cosmetics for safety. Companies test compounds to determine whether the substances will cause an allergic reaction or severe adverse reaction if applied to skin, hair and nails. Animal testing for cosmetics has been banned in the UK since 1998.

Why animal testing is used and may be needed – aids research, determine whether substances will cause an allergic reaction, limit potentially harmful exposure, practice surgical procedures and their safety, development of new medication and reaction, highly regulated with laws in place to protect animals from mistreatment.

Why animal testing is not needed - unethical, causing pain, loneliness and fear in animals, bad science as 95/100 drugs that pass animal tests fail in humans, wasteful of time and money, archaic as more modern technologies are now available.

Alternative safety testing for cosmetic ingredients: reliable and realistic alternative safety tests for cosmetic ingredients using non-animal test methods -

Using human cells and tissue studies on human volunteers (Ex Vitro Testing) - healthy and diseased skin cells and tissues are donated from surgery or after death for testing.

Growing artificial human skin (In Vitro Testing) - human cells have been used to create devices called 'organ-on-chips'. Computer models are designed to simulate human biology (In Silico Testing) - computer models are created for virtual experiments.

A01	AO2	AO3	AO4	AO5
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Cosmetic products and their effects:

Skin care -

Eye-makeup remover – gently emulsifying. **Cleanser** – removes surface grime and prepares the skin for further treatment.

Toner - returns skin to its natural pH and closes pores. Moisturiser - Rehydrates, nourishes and softens the skin.

Exfoliator – removes dead skin cells and improves skin texture.

Face Mask - deep cleansing, anti-ageing, smoothing and rehydrating.

Makeup products – foundation, concealer, powder, blusher, shader, highlighter, bronzer, eyeshadow, eyebrow pencil, eye-liner, mascara, lipstick, lip-liner, lip gloss.

Nail products -nail strengtheners, polish remover, cuticle cream, hand lotion, base coat, nail polish, topcoat.

Hair cleansing and conditioning products – shampoo, surface conditioner, restructurants.

Shaving products – pre-shave lotion, shaving cream, aftershave lotion, moustache wax, beard oil.

Hair styling and finishing products - setting/blow drying lotion, mousse, creams, gel, heat protector, serum/oil, hairspray, wax.

The pH value of cosmetic products:

pH stands for potential hydrogen and indicates acidity (0) to 7 (neutral) to 14 (alkaline) on a scale.

pH and our skin and hair: organ and tissue are made up mainly of water. **Skin** – using products which are high in alkaline (pH 7+) will dry out the skin and make it feel taut/tight because it is stripping the skin of its natural oil. Products which are very acidic (below pH4.5) will cause irritation or a burning sensation on the skin.

Hair – using products which are high in alkaline (pH 7+) will cause the cuticles to lift, which can result in damage and hair becoming tangled. Products which are very acidic (below pH4.5) will cause the outer layer of the hair to shrink and harden and eventually disintegrate.

Nail - if the pH gets slightly too alkaline, your nail beds will start producing more oil, because it can be harsh, drying and damaging to the nail.

Methods of testing pH products: Litmus paper, universal indicator.

LO2: Understand the structure	e and function of t	he integumentary system.
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Structure and function of the skin:

Primary component of skin cells is a protein substance called keratin.

Epidermis - is the top layer of the skin, it is made up of 5 layers (basal cell layer, prickle cell layer, granular layer, clear layer, horny layer). Main function is to protect the deeper living structures from invasion and harm from the external environment.

Dermis - is the middle layer of the skin and is 25 times thicker than the epidermis. It is made up of 2 layers (papillary and reticular) and contains many appendages including sweat glands, sebaceous glands, hair follicles, arrector pili muscles, nerve endings, dermal papilla, a rich blood supply.

Subcutaneous layer/Hypodermis - is the lower layer of the skin, it is made up of adipose tissue, (fat cells which act as energy reserves and provide protection to the underlying structures). Provides insulation to help maintain body temperature.

Functions of the skin - secretion, heat regulation, absorption, protection, excretion, sensation and vitamin D production.



Characteristics	of	skin	types:
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Balanced - fine and smooth texture, no visible pores, even colour, no blemishes, firm with good elasticity, feels soft and supple.

Oily - shiny, enlarged pores, congestion, blackheads

(comedones), sallow appearance, prone to acne and breakouts, thick and coarse surface texture.

Dry - lack of oil in the skin, dry to touch, thin, flaky patches, fine texture, broken capillaries and whiteheads (milia), rough/uneven texture, lacks suppleness, products are absorbed guickly.

Combination - most common skin type, usually oily T-zone is present with dilated pores and blackheads, normal to dry skin on the cheeks.

Characteristics of skin conditions:

Skin conditions can be influenced by environmental and lifestyle factors including diet, hormones, poor daily care. **Dehydrated** – skin lacks moisture, looks dull, may feel dry, itchy and tight, fine lines are visible, lacks elasticity. **Sensitive** – visible as redness on skin with low levels of pigmentation and darker patches.

Photo-aged - pigmentation changes due to exposure to UV rays, wrinkling due to damage to elastin and collagen fibres, decreased elasticity, uneven texture, broken capillaries.
Male skin - thicker and firmer as contains more collagen, oilier than female skin due to higher adrogen hormones, sebaceous glands are more active, often sensitive and dry due to shaving.

Common variations in skin physiology: absorbency, skin thickness, heat regulation, water retention.

A01	AO2	AO3	AO4	AO5
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Bacterial infections:

Impetigo – Itchy thin small blisters appear which burst and form honey coloured crusts.

Conjunctivitis - Eye becomes inflamed and red/sore.

Stye - Small red lumps containing pus on the eye.

Infectious skin conditions: infectious bacteria and viruses are easily transmitted from person to person.

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Viral infections:

Cold Sores - inflamed skin, red crusts that can weep.

Verrucas/Warts - warts very in size, usually rough texture and are raised. Verrucas grow inwards due to the pressure of body weight. Fungal infections:

Ringworm - small scaly patches which spread outwards then heal from the centre leaving a ring.

Tinea pedis/Athlete's foot - skin can appear white and spongy looking, can then become dry and cracked.

Infestations:

Scabies – tiny papules and wavy grey lines, scratching causes reddening and sores.

Non-infectious skin conditions and disorders:

Eczema - skin is red, dry and cracked, often itchy. Dermatitis - swelling and reddening, usually where the skin has reacted to an irritant, the reaction is localised to that area. Psoriasis - red patches, covered in silvery scales, bleeding can occur if scratched.

Acne - inflamed, comedones (blackheads), papules and cysts

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LO2: Understand the structure and function of the integumentary system.

A01	AO2	AO3	AO4	A05
Demonstrate knowledge and understanding	Apply knowledge and understanding	Analyse and evaluate knowledge and understandim	Demonstrate and apply relevant skills and techniques	Evaluate and draw conclusions to inform development

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Infectious skin conditions:

infectious bacteria and viruses are easily transmitted from person to person. **Bacterial infections:** Folliculitis - red lumps appear around the hair follicle. Yellowish fluid fills in infection site. **Barbers itch** - small yellow spots around the hair follicle. Fungal infections: **Ringworm** - small scaly patches which spread outwards then heal from the centre leaving a ring. Hair is likely to break off at site of infection. Infestations: Head Lice - lice cling to the hair

on the scalp and lay eggs clos to

the skin. Biting causes irritation and itching of the skin.

Non-infectious skin conditions and disorders:

Alopecia – bald patches appear in the hair.

Sebaceous cyst - ranges in size, lump in skin and cysts are the same colour.

Seborrhoea - oily scalp, hair looks greasy/wet, scalps can have spots present.

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Cuticle - outermost layer of the hair, protects the hair shaft and smooths cuticles to allow hair to shine.

Cortex - middle layer of the hair, forms the bulk and contains the pigment of the hair, gives the hair its strength and elasticity.

Medulla - central core of the hair, contains soft thin transparent cells and only exists in medium to coarse hair

Hair bulb - forms the base of the hair follicle, contains living cells that divide and grow Inner/outer root sheath - surrounds and protects the growing hair

Dermal papilla - surrounded by the hair bulb, provides the blood supply necessary for hair growth

Functions of the hair: insulates the scalp to keep us warm, eyebrowd cushion the brow bone and prevents sweat from running into our eyes, eyelashes prevent dust from entering our eyes, body insulates the body, regulates heat and sensation detects changes to the environment.



Elasticity - strength of hair. Characteristics that may affect the scalp:

Porosity - damage to cuticle layer, ability to absorb water

Dry hair - dull, breaks and splits easily, coarse texture.

Oily - overactive sebaceous glands produce too much sebum making the hair and scalp look greasy and dull.

Chemically damaged - coarse texture, dull, split ends, tangles easily, hair breakage/loss, weak.

texture, shiny, holds curl well, relatively easy to comb while wet, good elasticity, no breakage.

Hair defects - split ends (split, dry ends of hair), damaged cuticle (rough, dull hair shaft)

Non-chemically treated hair - completely unprocessed, unpermed/uncoloured/ untreated, smooth

Environmentally damaged - dull, coarse texture, split ends, hair loss, no elasticity.

Dry - not enough sebum is produced resulting in an itchy, flaky, tight dry scalp.

Dandruff aff ey flakes of skin present on scalp and in the hair resulting in itchy, red scalp with greasy patches.

Hair Classification:

	Hair Type					
		Straight Type 1	Wavy Type 2	Curly Type 3	Tight Curls Type 4	00000
	Fine	1a Straight	2a 'S' pattern	3a Soft Curl	4a Tightly Coiled	~~~~
r Texture	Medium	1b Straight with volume	2b Frizzy 'S' Pattern	3b Loose Curl	4b 'Z' pattern	\sim
Hail	Coarse	1c Straight and difficult to curl	2c Very frizzy 'S' pattern	3c Tight curl	4c Tight 'Z' pattern	

fec	ted	-	white or	g	gre

Characteristics of hair conditions :

Characteristics of hair:

Density - fine/medium/thick

Texture - fine/medium/coarse hair

LO2: Understand the structure and function of the integumentary system.

Structure and function of the nail:

Nail plate - found on top of the nail bed, protects the nail bed. Cuticle - found at the base of the nail, protects the matrix from infection Nail wall - found at the sides of the nail plate, cushions and protects the nail plate and grooves, Nail bed - found under the nail plate, provides the rich blood supply which supplies nourishment for nail growth.

Free edge – extends beyond the fingertip and protects the fingers and toes **Matrix** – living part of the nail, produces new nail cells as it contains lymph, blood vessels and nerves

Function of the nail - to provide protection to the end of the toes and fingers, increases dexterity (help to pick up small things), used for adornment





Characteristics of the nail

A healthy nail is smooth, curved and without hollows or wavy ridges, flexible, translucent, pinkish in colour.

Brittle nails - very hard, inflexible, tend to break easily, dehydrated nail plate.

Soft nails - thin, weak, lack lustre, break/peel easily.

Ridged nails - may have been damaged at the matrix, rippled, unsmooth appearance.

Peeling nails - thin, flaky, tend to be short.

Discoloured nails – the nail plate can be discoloured by using incorrect nail polish and Chemicals.

Nail Shapes:

Popular nail shapes include - square, oval, round , pointed.

Undesirable natural nail shapes include - fan, hook/claw/convex, spoon/ski jump/concave.

Infectious nail conditions:

Ringworm - small scaly patches which spread outwards then heal from the centre leaving a ring. Hair is likely to break off at site of infection.

Warts - small growth on the skin caused by a virus, warts very in size, usually rough texture and are raised.

Paronychia – bacteria invades the skin around the sides or base of the nail, areas becomes red and swollen.

Ingrown toenails - nail plate grows into the skin of the nail wall.

Non-infectious skin conditions and disorders:

Nail biting - may be sensitive to touch, short or little nail plate which appears flat until regrown.
Overgrown cuticles - living skin that becomes attached to the nail plate at the cuticle.
White spots (leuconychia) - caused by trauma to the nail plate or matrix, separation from the nail bed.

Hang nails - split cuticles, cracking of the skin around the nail plate and a small piece of skin protrudes between the nail plate and nail wall.

Pitting - small indents or depressions in the nail plate, can be a sign of psoriasis, eczema or vitamin deficiency.

A01	AO2	AO3	AO4	A05
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The intrinsic factors: (internal)

Genetics – primarily the genetic composition of our skin type and colour inherited which affect ageing. Hormonal imbalance – as we get older, hormone activity decreases which affects collagen and elastin production. Health conditions – affect the body in many ways. The Fitzpatrick Scale – system for skin type classification according to tolerance and reaction to UV radiation.



The extrinsic factors: (external)

Stress - 7-9 hours of sleep are needed to help prevent fatigue.

Diet – excess weight loss and gain affect the elasticity and firmness of the skin.

Medication - may have side effect which impact other systems in the body including hair, skin and nails.

UV exposure - sun's UV light damages the fibres called elastin, skin needs to be well protected.

Climate – aircon/heating, high altitudes can dry out the skin, colder climates dry out the skin and watmer cause the skin to sweat causing breakouts.

Incorrect product use - can cause issues and problems Lifestyle - hobbies, sleep, workload, wellbeing

LO3: Understand the development of hair and beauty products.

Historical evolution of hair and beauty products:

Ancient Egyptians – both men and women wore make-up, the higher the status of the person, the heavier the application of make-up. Wigs were worn to declare the status of the person. Kohl was used to draw thick, distinctive black lines to give an almond shape around the eyes and to protect the skin from the sun

Ancient Greeks and Romans – olive oil was mixed with ground charcoal, soot or ash to make eyeshadow, eyebrow filler and eyeliner, to create heavy dark eyebrows or a unibrow. Hair was made brighter with the use of lotions, ointments and beeswax.

Renaissance period – blonde hair was considered to be angelic, substances such as alum, sulphur and soda were commonly used to lighten the hair. White lead powder was used to create a pale ivory skin. Egg whites were used as foundation for a taut and shiny complexion.

 $\ensuremath{\text{Victorian era}}$ – Queen Victoria publicly declared that make-up was improper and

vulgar. Hair was washed with cool water and vinegar. Sparse eyebrows and eyelashes were improved by using mercury as a nightly eye treatment. Wafers containing arsenic were nibbled to help maintain a pale complexion **Twentieth century** – bright red lips were an iconic look of the early twentieth century. Eyelashes were heavily defined using a wax-based cake mascara. The first lip gloss was developed by Max Factor. The multi-step skincare system was launched in the mid twentieth century along with anti-ageing products. Heavy petroleum jellies and mineral oils were used to style hair into quiffs. The latter end of the twentieth century introduced highlights, rainbow hair dyes along with bright coloured eyeshadows and pearlised lipsticks

Twenty first century – the smoky eye look was introduced along with eyelash extensions and eyebrow pomade to create perfectly defined eyebrows. Heat defence, leave-In conditioners and heat protection sprays helped to maintain smooth sleek hair. Natural and organic ingredients replaced animal and synthetic derived cosmetic ingredients. Bar soap was replaced by scented liquid soap. The European Union implemented an animal testing ban on finished cosmetic

Product development process:

Design brief/conception, formulation, sourcing, quality and compliance, packaging, product validation, marketing campaign, launch

Specialists involved in the development process:

Chartered Cosmetic Chemists – focus their research on creating new cosmetics and experiment with creation and improvement of products.

Toxicologists - researches and identifies the impact of chemicals, toxic materials, new medication and radiation on people, animals and the environment.

Microbiologists – helps find the right preservation system that work with a product's function and form and test the effectiveness of these.

Regulatory Experts - make sure the product meets all regulations from local to international and industrial.

Formulation of products:

Compatibility stability and preservation, types of mixtures (solutions, solvents, solubility, emulsions, gels, suspensions), the effects of the formulation on the skin and hair, patenting hair and beauty formulas (trade secrecy with manufacturer 'special products').

Relevant legislations and regulations:

Cosmetic Products (Safety) Regulations – is the product safe to use?

Cosmetic Products Enforcement Regulations – have certain substances like UV filters been restricted?

Trade Descriptions Act – is the packaging correctly labelling the product?

A01	AO2	AO3	AO4	AO5
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The impact of pollution on the planet:

Environmental sustainability:

Sustainable and ethical beauty and hair products/brands:

Vegan -products that do not contain any animal by-products or use any in the production process so more sustainable practices are used in the production process.

Natural - products pose no harm when rinsed away and can be sustainably sourced. Hypoallergenic - No artificial colours or flavours, pose less of a risk to the environment using natural chemicals.

Organic - produced using no artificial chemical pesticides or fertilisers so less impact on the health of soil and wildlife.

Cruelty free - products that are not tested on animals, includes their ingredients so less impact on the ecosystem and less harmful ingredients which cause pollution. PETA.

Alcohol free – doesn't contain ethanol which doesn't take away production of food for humans or livestock, lessens the production of carbon dioxide.

Dermatologically tested - the final product has been tested on human skin.

Manufacturing sustainability -

Packaging – aluminium, reusable/refillable glass bottles, bar/liquid soaps Native ingredients – importing ingredients contributes to global emissions through air miles.

Renewable sources – bacteria, plants, natural oils, upcycling materials e.g. citrus extracts.

Effects on the environment:

Social and environmental impact of palm oil farming – rainforest destruction, damage to climate, endangering life of primates and other wildlife The impact on the planet of pollution – landfills, air pollution, pollution of waterways and oceans, non-biodegradable chemicals and products (single use plastics, microbeads, toxic chemicals such as formaldehyde, acetone)